DISSERTATION

WEALTH COMPOSITION, CAPITAL FLOWS, AND THE INTERNATIONAL FINANCIAL SYSTEM

Submitted by

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ABSTRACT

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International capital flows play a critical role in the development process. On the one hand, a *stable* stream of capital flows could augment the capital stock accumulation of a country and, hence, spur economic growth. On the other, *volatile* capital flows increase the risks that could induce financial and economic crises. Moreover, contrary to the efficient allocation implied by the neoclassical growth theory, Lucas (1990) poses the paradox of "Why Doesn't Capital Flow from Rich to Poor Countries?". Recent studies also demonstrate an even stronger phenomenon known as the allocation puzzle or upstream capital flows. That is, fast-growing emerging markets have associated with net capital outflows on average (e.g., Gourinchas and Jeanne 2013). While previous studies provide explanations about cross-country differences in human capital (Lucas 1990), institutional quality (Alfaro et al. 2008), I argue that the capital flows are also explained by differences in natural resources in the current era of financial globalization. In general, I demonstrate the role of initial wealth compositions.

In this dissertation, I define capital stock more broadly than the standard neoclassical growth model in terms of wealth accumulation, comprising physical capital, human capital, natural capital, net foreign assets, social capital, and domestic financial capital (as in Gylfason 2004). By exploiting a recent database on wealth accounting by the World Bank, I find that the wealth composition matters in explaining capital flows across 108 countries over 1995-2015. More importantly, results of Chapter 1 suggest that initial abundance measures of *subsoil* natural

resources and net foreign asset positions explain much of the subsequent annualized average net capital inflows. An alternative measure of net capital inflows also suggests a stabilizing role of the valuation effects in the international financial system. In sum, measures of wealth abundance and net capital inflows should be considered carefully in studying the patterns of international capital flows. Results from the typical measure suggest that capital mobility allows subsoil resource-rich countries to invest their resource rents abroad, so they could better smooth the use of resource windfalls. Therefore, the inclusion of natural capital emphasizes the role of economic management in whether to channel rents toward productive investment and human capital to industrialize the economy, or to accumulate foreign assets for exchange rates managements and for precautionary motives due to volatile international commodity prices. It should be noted that there is no evidence on the neoclassical allocative efficiency— the relationship between economic growth rates and net capital inflows.

Due to the insignificant finding of the allocative efficiency, Chapters 2 and 3 extend and modify the first chapter's conceptual framework. Chapter 2 investigates not only international capital flows but also some explanations for the persistent global imbalances. Using a unified sustainable growth framework with a broad definition of total wealth, I demonstrate that there could be specific spillover effects (or specific complementarities) rather than an overall complementarity effect, which is simply proxied by real per capita growth rates. For instance, the interaction between human capital and physical capital generates a positive spillover effect, as explained by Lucas (1990). Thus, the departure from the focus on the overall complementarity to specific complementarities and tradeoffs in capital stocks provides us with a way of testing for 13 hypotheses, motivated by the broad literature of international finance and sustainable development. Some of these are about a human capital externality, the global saving glut argument, and negative spillover effects from natural capital on institutions and financial development. I also test for Blecker's (2005) argument on comparative advantage in selling financial assets and find supporting evidence. The implication of such findings implies that the current account (CA) deficit countries with highly developed financial systems have benefited from the current international monetary and financial system (IMFS) through the role of valuation effects. On the other hand, financial liberalization allows subsoil-rich economies to smooth the use of windfalls through foreign reserves accumulation. Other developing countries with CA surpluses due to excess savings, rather than low imports, reflect the flaws in the current IMFS.

Chapter 3 is motivated by utilizing theoretical insights from overlapping generations (OLG) models with non-Ricardian equivalence, rather than the assumption of the infinitely lived agent as in previous chapters. I, therefore, examine not only net total capital inflows but also consider the distinction of private and official flows. In addition to the heterogeneities in economies' wealth compositions, I investigate the role of demographic structures by highlighting the aging population phenomenon. In other words, while using the unified sustainable growth framework with a broad definition of wealth, I distinguish between private and official capital flows, and between the relative ratios of young and old groups to the working-age population. All these factors relate to capital flow movements through their effects on saving-investment decisions. Overall findings support the adoption of OLG with non-Ricardian equivalence models in analyzing aggregated and disaggregated capital flows. Also, the inclusion of demographic factors seems to correct for the omitted variable bias. Moreover, cross-country differences in initial wealth compositions are of great importance for different types of disaggregated capital flows, and so policy implications differ accordingly.

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DEDICATION

To my mother, and the memories of my adored father.

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Chapter 1

Wealth Composition, Valuation Effect, and Upstream Capital Flows

1.1 Introduction

A stable stream of foreign capital flows plays a critical role in the development process by augmenting capital stock accumulation and sustaining the current account deficits of a country. On the one hand, standard neoclassical theory predicts that returns to capital should be higher in poor countries, in terms of capital-labor ratio, and hence international capital should flow in to exploit such high returns.[1] On the other hand, Lucas (1990) observes a puzzle that very little capital flows into poor countries, and Gourinchas and Jeanne (2013) find an allocation puzzle that fast-growing emerging markets and developing economies (EMDEs) have associated with net capital *outflows*. In a few words, the allocation puzzle is the Lucas puzzle but in first differences (gross versus net inflows, and income levels versus growth rates). Surprisingly, cross-country differences in natural resources have been neglected in the empirical literature of global capital allocation although there is a wide literature on the natural resource-growth nexus. Primary goods exporting countries could be a major underlying source of the upstream capital flows due to their economic structure and the Dutch disease effects. Therefore, I aim to investigate the role of initial wealth composition on the medium- to long-term capital flows, while revisiting the neoclassical allocative efficiency hypothesis across 108 countries over 1995-2015. Wealth is defined more broadly to include net foreign assets, produced capital, human capital, natural capital, social capital, and domestic financial capital (Gylfason 2004).

[1] This is due to the law of diminishing returns— a decreasing marginal productivity of capital.

Accordingly, I take advantage of a recently released dataset on wealth accounts by the World Bank, supplemented by proxies for the last two types of capital stocks. Moreover, I will consider the role of valuation effects in studying capital movement patterns, as emphasized by recent literature (e.g., Lane and Milesi-Ferretti 2017, 2007; Gourinchas and Rey 2015).

First, the literature on capital flows adopts the view from growth accounting literature that cross-country differences in output growth mainly stem from differences in their total factor productivity (TFP). It implies that fast-growing economies would invest more and associate with higher returns to capital, so they should attract more foreign capital inflows. Nevertheless, data on actual capital flows show the opposite pattern to what the theory predicts. Related studies, therefore, modify some assumptions of the neoclassical growth model (NGM) and/or incorporate other factors to provide some explanations. For instance, Lucas (1990) asserts that the answer to the puzzle is about cross-country differences in human capital, rather than expropriation risks. Hence, he illustrates a model in which human skills enter an aggregate homogeneous production function as a positive externality to ensure sustained growth only in advanced countries. Surprisingly, the recent few decades show that EMDEs have relaxed restrictions on foreign investment but, unexpectedly, this has been associated with relatively higher growth rates and greater net capital *outflows*. Consequently, if the answer is not about human capital or even capital mobility, what could be the answer? Alfaro, Kalemli-Ozcan, and Volosovych (2008) investigate empirically the Lucas Paradox and conclude that the answer is all about institutions, contrasting with the Lucas argument on human capital. Yet, the role of natural resources has been neglected in such empirical studies, so the current study aims to fill this gap among other considerations.

Although some authors provide a set of possible explanations such as the Dutch disease effects (e.g., Prasad, Rajan, and Subramanian 2007), natural resources do not appear in their empirical models of capital flows. First, booms in commodity prices could lead to exchange rates appreciation and factor movement toward resource sectors and hence the growth-inducing industrial sector could shrink over time. Second, during busts, such countries would face difficult times of large currency depreciation and debt crises especially if there are no accumulated foreign reserves that help them to better manage volatility. Moreover, the Permanent Income Hypothesis (PIH) is interpreted in the empirical literature of capital flows in contrast to the literature of natural resources. For instance, Gourinchas and Jeanne (2013) assert that the evidence of the allocation puzzle contradicts the implication of PIH— growing economies should invest and borrow more due to their expected high growth rates. In other words, real-world data show a puzzling behavior that highly growing economies are positively correlated with net savings, while the PIH suggests that they should associate with net investment based on the interpretation of Gourinchas and Jeanne. However, the role of natural resources is completely neglected in such empirical studies on capital flows. With exhaustible natural resources, however, I argue that the PIH should be interpreted the other way around. That is, resource-rich countries should save more during booms to better manage their economies during busts. In sum, previous studies on capital flows provide a set of explanations to explain the Lucas Paradox and/or the allocation puzzle (known also as the upstream capital flows). Such explanations could be categorized into two broad groups as follows: 1) differences in factor supply endowments (mainly physical and external financial positions), and 2) differences in productivity growth. Unfortunately, such studies do not specifically control for cross-country differences in the abundance of natural resources that could drive the upstream capital flows.

Besides, another issue is the difficulty of constructing a direct *stock* measure of human capital. In previous studies, human capital is argued to be implicitly captured in TFP as in Gourinchas and Jeanne (2013), or generally by using some proxies as average years of schooling. First, since the mid-1980s, the World Bank has noticed that the GDP of resource-rich countries could be inflated, reflecting liquidation of natural resources rather than productivity improvement. Fortunately, Lange, Wodon, and Carey (2018), from the World Bank, have constructed a dataset on wealth accounts for 141 countries over 1995-2014. They emphasize that cross-country economic comparisons should focus not only on income but also on wealth levels. Among other estimate improvements, human capital is measured in a *stock* unit for the first time, using over 1500 global household earnings' surveys. Interestingly, their data show that the share of both human and natural capital assets accounts for about 70 percent of wealth in most countries in 2014.[2] While the former is higher in advanced countries, the latter is higher in less developed countries. Thus, exploiting this recently released data on wealth accounts could help for a better understanding of international capital flows.

In this study, therefore, I attempt to answer the following questions:

- Does the wealth composition matter in explaining the upstream capital flows?
- Does the efficient allocation hypothesis still hold true with the broad wealth definition?
- Would decomposing natural capital into the subsoil and non-subsoil natural capital make a difference in explaining international capital flows?
- Do valuation effects matter in the current international financial system?

[2] Refer to Table 1.1.

To do so, I will investigate the role of cross-country differences in wealth components and real per capita growth in explaining the pattern of capital flow, all in per capita units. Besides the typical measure of net capital inflows, I also consider measures of net capital inflows that incorporate official aid flows and valuation effects. In addition, the current study covers 108 countries over 1995-2015, and the reason behind choosing this period is twofold. First, I attempt to explain medium- to long-term movements of capital flows and, hence, I must include as many years as possible while data on wealth starts in 1995. Second, this period is characterized by financial globalization— more openness to foreign capital flows, financialization— a greater role of financial activity on economic outcomes, volatile global commodity prices. Our main prior expectation is that natural capital (especially, subsoil types that include energy, minerals, and metals) plays an important role in explaining the upstream capital flows. To the best of my knowledge, this is the first paper that incorporates the role of cross-country differences in initial wealth composition to investigate international capital flows movements in a unified framework, using the best available estimates of total wealth.

An overview of the main findings suggests the importance of the measure choice of the net (total) capital inflows, differences in the initial abundance of natural capital as decomposed into the subsoil and non-subsoil types, as well as net foreign assets and human capital. First, the introduction of natural capital allows for the role of economic policy, unlike the standard neoclassical model. Policymakers in EMDEs could decide the pace of depleting the natural resources and hence affect the GDP level and growth (through liquidation not productive investment) as well as the scale of capital movements when they mitigate the Dutch disease effects. While the *aggregate* natural capital does not matter, its decomposition into subsoil and non-subsoil resources helps in explaining international capital flows. Subsoil-exporting countries are known to enjoy relatively higher windfalls. Second, there are three motivated measures of net capital inflows that I discuss in section 2, and interestingly, I find that once I incorporate valuation effects, results alter, especially with regard to the global imbalances evidence. Overall, findings from the *typical* measure show evidence on persistent global imbalances, as countries with initial CA surpluses (or a positive external financial position) have continued to have CA surpluses on average. More importantly, findings suggest that countries with a greater initial abundance of *subsoil*, rather than non-subsoil*,* natural capital are associated, on average, with subsequent annualized averages of net total capital *outflows* during 1996-2015. That is, subsoil natural assets seem to drive the upstream capital flows, whereas the reverse holds true for non-subsoil natural resources (i.e., agricultural land, pastureland, forests, and protected areas). This could imply that resource-rich countries have used their natural resource rents to accumulate foreign assets. Thus, they seem to follow the PIH implication that these countries attempt to smooth the use of resource windfalls overtime. In other words, resource-rich countries save more during resource temporary windfalls/rents to dampen the effects of potential future shocks or when they run out of resources. Besides, EMDEs have experienced economic and financial crises due to fickle capital flows, so reserves act as a buffer during financial stress. Furthermore, most EMDEs adopts fixed-to-less-flexible exchange rate regimes, which require foreign exchange interventions using accumulated foreign reserves. The main implication of this study, therefore, suggests that there is a greater role of the developmental states in utilizing resources and using the exchange rate as an effective tool within a well-targeted industrial policy. Countries with greater subsoil assets should improve their macroeconomic management to achieve sustainable high growth performance.

The remainder of the paper is structured as follows. The next section demonstrates the importance of wealth composition across countries and alternative measures of net (total) capital inflows, and then sheds light on some caveats. Section 1.3 reviews the related literature. Section 1.4 develops a conceptual framework in order to make prior hypotheses and presents preliminary unconditional correlations. Section 1.5 covers data sources, summary statistics, and an empirical approach with some challenges. Section 1.6 reports regression results and runs a battery of robustness checks. Section 1.7 discusses major findings along with their policy implications, and then concludes.

1.2 Wealth and Capital Flows: Measurements and Issues

1.2.1 Importance of Wealth Composition

Since the mid-1980s, the World Bank has continued improving welfare accounting measures because of the belief that the GDP of natural resource-rich countries is inflated due to the liquidation of resources. The GDP measure does not reflect actual productivity gain, especially for cross-country comparison. Recently, Lange, Wodon, and Carey (2018), from the World Bank, construct estimates of total wealth (W). They define wealth as the sum of produced capital and urban land (K_P), net foreign assets (NFA or K_F), human capital (K_H), and natural capital (K_N).

$$W = K_P + K_F + K_H + K_N \tag{1.1}$$

Table 1.1 shows the share of each capital type in total wealth across country groups, based on real per capita income in 2014. Human capital and natural capital together account for more than 70 percent of the wealth in all country groups, where the former is relatively higher in more developed economies.[3] Moreover, it shows the importance of differentiating between OECD and high-income non-OECD countries, as non-OECD countries have a noticeably different wealth composition. Hence, considering such comprehensive data on wealth could reveal structural, economic explanations for predicting capital flows across countries.

Table 1.1: Wealth composition across country groups, 2014

Type of asset	Low-income countries (%)	Lower-middle-income countries (%)	Upper-middle-income countries (%)	High-income Non-OECD countries (%)	High-income OECD countries (%)	World (%)
Produced capital	14	25	25	22	28	27
Natural capital	47	27	17	30	3	9
Human capital	41	51	58	42	70	64
Net foreign assets	-2	-3	0	5	-1	0
Total wealth	100	100	100	100	100	100
Total wealth, US$ billion	$7,161	$70,718	$247,793	$76,179	$741,398	$1,143,249
Total wealth per capita	$13,629	$25,948	$112,798	$264,998	$708,389	$168,580

Source: Lange, Wodon, and Carey (2018, p. 8) [In constant 2014 US$]

Among other improvements, this represents a significant development in estimating human capital as a *stock* unit, and in estimating natural resources based on the expected lifetime of resources. First, data on human capital stocks are constructed based on over 1500 global household surveys to reflect expected lifetime earnings using Jorgenson-Fraumeni's (1989, 1992) approach, which asserts that higher lifetime earnings embody relatively higher skills.

Moreover, while the World Bank used to estimate natural capital with a cap of 25 years on a resource lifetime rents, they have advanced their calculation method to cover the expected lifetime of natural resources. That is, natural capital reflects the discounted present value of expected lifetime rents. Natural capital includes energy, minerals, metals, agriculture land, pastureland, forests, and protected areas. Furthermore, it should be noted that data on net foreign

[3] Table 1 shows that the average *total* wealth of high-income non-OECD countries is very low relatively due to their economy sizes. For a cross-country comparison, it is important to consider *per capita* units, as in the last row. That is, the average *per capita* total wealth increases monotonically with the level of development.

assets reflect the difference between a country's foreign assets and liabilities, which estimates are adopted from the work of Lane and Milesi-Ferretti (2007, 2017).

Although this dataset is the most accomplished effort yet for wealth accounting, there are some caveats. First, some important natural capital components are missing. These include renewable energy, fish stocks, water, and ecosystem services such as land and forest degradation. Second, the World Bank excludes *social capital* from this definition of wealth due to difficulties in obtaining robust estimates (for details, refer to Lange et al. 2018). Besides, I argue that income distributional dynamics could vary across countries and adopting the human capital stock measure could pose concerns when used in a cross-country context. Shortly, in a cross-country comparison I believe that the calculation method is more of how relatively cheap, rather than skilled, workers are. In addition, Gylfason's (2004) definition of wealth is broader in which the sixth asset type is domestic financial capital.[4] Although these limitations are beyond the focus of this paper, an attempt will be made to mitigate such issues by considering proxies for social capital/ institutions and for domestic financial development, while exploiting the best available estimates yet of wealth to explain international capital flow patterns during 1995-2015.

1.2.2 Alternative Measures of Net Capital Inflows

Previous empirical studies demonstrate that there is no direct, single and available measure of net (total) capital inflows in the data, so they first motivate for that (e.g., Alfaro et al. 2014).[5] Although it could be possible to sum up many variables of capital flows per type, measurement issues and errors would arise especially across a wide set of countries. Therefore, previous literature motivates their measures from national income and the balance of payments

[4] Gylfason (2004) defines total wealth as follows:

$$W = K_P + K_F + K_H + K_N + K_{Social} + K_{Domestic\ Financial}$$

[5] Only disaggregated capital flows per types are available in the data.

identities. Nevertheless, I observe some discrepancies surrounding such alternative measures. To illustrate that, I start with an overview of the typical measure used widely in the literature and then compare it with other measures.

Starting off with the typical measure adopted in the literature, which is the reverse sign of a country's current account (CA), normalized by the GDP level.[6] The theoretical motivation could be shown through straightforward accounting identities. First, a country's net national (private and public) savings are equal to the current account balance as simplified as follows:

$$(S - I) + (T - G) = (X - M) = CA \tag{1.2}$$

The second motivation is illustrated within the balance of payments (BOP) identity. Empirical studies adopt this definition from the simple BOP identity, based on the 5th manual edition by the IMF, which is as follows:

$$BOP = Current\ Account + Capital\ Account + Financial\ Account$$

$$+ Errors \text{ and } Omissions = 0$$

$$BOP = CA + KA + FA + EO = 0 \tag{1.3}$$

Due to the double-entry accounting in the BOP, the sum of all components must always be zero. Alfaro et al. (2014) show that the KA constitutes a very negligible part, based on the data, because this account records capital transfers and the acquisition and disposal of non-produced, non-financial assets. Also, they illustrate that the general practice is to consider negative (positive) values of EO as non-reported capital outflows (inflows). Therefore, equation (1.3) is simplified to the following equation:

$$Net\ Capital\ Inflows = -CA = FA + \text{EO} \tag{1.4}$$

[6] The scaling by GDP level helps to eliminate concerns on economy-size differences.

That is, reversing the sign of the CA measures the financial account, which records the following capital flows transactions: foreign direct investment (FDI), equity and debt portfolio investment, other investment, IMF credit, and changes in official foreign reserves. However, this measure neglects the fact that the CA comprises not only the trade balance but also unilateral aid transfers and investment income to national factors of production. Particularly, official aid flows could be significant in low-income countries, helping finance their trade deficits without receiving capital flows reported in the FA balances. Investment income could also play a critical role especially when linking the recorded flow-unit CA balances to the stock-unit net foreign asset (NFA) positions, in this era of financial globalization.

Accordingly, there could be two additional measures of net capital inflows. First, official aid flows have played an important role in low-income countries. Alfaro et al. (2014) state that “capital flows into low-productivity developing countries have largely taken the form of official aid/debt.” (p.3) Also, there is a rich strand of the literature on the growth impact of foreign aid flows although evidence on the growth impact is inconclusive (e.g., Rajan and Subramanian 2008). Hence, I should include aid flows, reported in CA, to the other types of capital flow, reported in FA. The focus will be on Official Development Assistance (ODA) aid flows that include both grants and concessional loans for humanitarian and economic development rather than military assistance. Recall the BOP identity (B=-CA=FA=0) and note that net aid receipts are reported with a positive sign (credit in the CA) while all other types of capital inflows are reported with a negative sign (debit in the FA). Consequently, our second measure will be as in equation (1.5):

$$Net\ (total)\ capital\ inflows = -CA + Net\ Aid\ Receipts \tag{1.5}$$

Furthermore, the third motivated measure is emphasized by the recent literature on global imbalances. The net foreign assets (NFA) of a country summarize not only the cumulative CA balances over time but also reflects any valuation effects (VE) — capital gains/losses due to asset price changes and exchange rate movements, as in equation (1.6):

$$NFA_{(T)} = Stock\ of\ Foreign\ (Assets - Liabilities)_{(T)} = \sum_t^T CA_{(t)} + VE_{(T)} \qquad (1.6)$$

Interestingly, Gourinchas and Rey (2015) illustrate two related stylized facts. First, they show a discrepancy between cumulative CA and NFA due to fluctuations in values of existing assets and liabilities (or the valuation effect). They also demonstrate that while the G7 advanced countries are the largest winners, BRICS countries have been losers in terms of the valuation effects. Unlike CA flow units, the NFA positions are reported in a stock unit. By the stock-flow accounting, I could use equation (1.6) to derive a flow-unit measure, which captures the CA balance plus any changes in the values of foreign assets and liabilities of a country at a specific year. Since the change in NFA reflects net capital outflows, I reverse the sign to capture net capital inflows. In other words, the negative change in NFA means a change in net foreign liabilities (NFL). Thus, the third measure of net capital inflows is simplified as in equation (1.7):

$$\Delta NFL_t = -\Delta NFA_t = -(CA_t + \Delta VE_t) \qquad (1.7)$$

A country with a positive value of ΔNFL implies that it attracts net capital inflows, plus any capital losses (gains) if such value is greater (less) than that of the typical measure of equation (1.4) in a specific year.

Then the question comes of whether these measures could be used as close substitutes for the empirical regression analysis in the next sections. For comparison, I calculate annual averages for the three measures of net capital inflow as in equations (1.4, 1.5, and 1.7), normalized by nominal GDP, over 1996-2015. Table 1.2 reports the correlation matrix of these measures. The typical one (-CA) and the aid-adjusted measure (-CA+Aid) are highly correlated, so they could be close substitutes for a regression analysis. One the other hand, there is a weaker correlation with the valuation-adjusted measure (ΔNFL), reflecting the important role of valuation effects. Consequently, while the focus should be on the typical (-CA) and the valuation-adjusted (ΔNFL) measures, I will keep comparing results even with the aid-adjusted measure (-CA+Aid) to disentangle detailed commonalities and differences.

Table 1.2: Correlations between Measures of Net Capital Inflows
(Annual Averages during 1996-2015, %GDP)

	-CA	ΔNFL	-CA + Aid
-CA	1.0000		
ΔNFL	0.3901* (0.0001)	1.0000	
-CA + Aid	0.9330* (0.0001)	0.2208* (0.0216)	1.0000

Note: * p<0.01.

1.3 Literature Review

At the time Lucas (1990) posed the paradox of why very little gross capital flows into developing countries, those countries were, in fact, under the early stages of capital account liberalization. Nevertheless, the degree of capital account openness across countries seems to be completely ignored by Lucas. For him, the answer to such a paradox, which contrasts with the prediction of the standard neoclassical growth model (NGM), is about cross-country productivity differences stemming from human capital. Since then, many studies have emerged and attempted to explain the Lucas paradox which has even reinforced over time. On the one hand, since the mid-1990s, many emerging markets and developing economies (EMDEs) have opened their capital accounts (Kose et al. 2010) and, interestingly, recent studies show that EMDEs have experienced higher growth rates than advanced economies, contrasting the Lucas' observation of a relatively higher productivity growth in advanced countries. Most importantly, EMDEs have experienced more of both *gross* capital inflows and outflows, while many fast-growing EMDEs have even been associated with *net capital outflows*. This pattern of capital flows has become known as the *upstream capital flows* (Alfaro, Kalemli-Ozcan, and Volosovych 2014), *uphill capital flows* (Prasad, Rajan, and Subramanian 2007), and the *allocation puzzle* (Gourinchas and Jeanne 2013). In sum, the allocation puzzle is the Lucas puzzle but in first differences. That is, while the Lucas paradox is about the association between per capita income levels and gross capital inflows, the allocation puzzle is about the association between per capita income growth rates and net capital inflows.

Other studies provide different explanations for the Lucas Paradox and/or the allocation puzzle such as differences in institutional quality, international capital markets frictions, and uncertainty. Nevertheless, previous empirical studies have been neglecting the role of natural resource abundance. Gourinchas and Jeanne (2013) find empirical evidence on the negative association between productivity growth and net capital inflows while controlling for financial openness along with an interaction term, which slightly dampens the allocation puzzle for only the highly growing EMDEs. Then, they conduct a wedge analysis by distorting both savings and investment, and conclude that the allocation puzzle is a *saving puzzle*. That is, EMDEs do not face saving constraints but investment constraints. Alfaro et al. (2008) find evidence that institutional quality is the leading factor behind the Lucas Paradox over 1970-2000. Similarly, Papaioannou (2009) uses a large panel dataset on bilateral capital flows from banks to study the Lucas paradox while adopting a gravity model. By exploiting two models, one of which considers time-varying effects and the other mitigates the endogeneity concerns, his findings suggest that institutional quality explains a large part of the Lucas Paradox. Also, an interesting observation noted by Araujo et al. (2015) is that export revenues could substitute for capital flows (p. 16). In this regard, one could think about export revenues from natural resource liquidation and trade as a substitute for the need for capital inflows. Furthermore, Prasad et al. (2007) discuss a set of possible explanations, including the Dutch disease effects. In fact, this is a great support to the current study's motivation for introducing a measure of natural resource abundance since many oil-exporting countries, for example, have enjoyed current account surpluses/net capital outflows due to higher prices of their exports. It should be noted that resource-rich countries are usually excluded from the sample of most previous studies.[7] On the contrary, I address the role of natural resource differences in examining international capital movements.

The current study is also related to the branch of the literature on institutions, natural resources, and economic growth. One the one hand, Acemoglu, Johnson, and Robinson (2001) argue about the fundamental role of today's institutions on growth performance. One the other hand, Gylfason (2004) highlights the role of natural capital which directly and adversely affects output levels, while indirectly crowds out other types of capital, one of which is social capital — mainly good institutions. Gylfason explains that endowments of natural resources induce rent-seeking activity which reflects on the current institutional quality. In regard to the capital flows, the main finding of Alfaro et al. (2008) implies that the lack of good institutions explains the Lucas paradox. Nevertheless, their empirical analysis does not control for natural resources, which I will consider in this study.

Since I exploit current account data, the study is also related to the branch of the literature on savings, investment, and growth.[8] All of which are also related to the permanent income

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[7] The main reason could be that most *standard* growth/capital flows empirical studies do not control for differences in natural resources and, hence, they exclude such resource-rich countries for being influential observations.
[8] Recall that CA reflects the difference between a country's savings and investment.

hypothesis (PIH) in which current consumption is a function of permanent income. Recall that the neoclassical growth model maximizes the consumption level for the infinitely lived agent subject to the intertemporal budget constraint, whereas other markets are in equilibria. Some studies also illustrate a positive *bidirectional* association between savings to growth, as an explanation for the allocation puzzle (Prasad et al. 2007; Gourinchas and Jeanne 2013). Gourinchas and Jeanne, however, conclude that fast-growing EMDEs do not face savings constraints but investment constraints and, therefore, the allocation puzzle is a saving puzzle—they should invest more by borrowing against their expected future high growth rates following the PIH. Extending this line of research, I suggest that the PIH for resource-rich EMDEs, facing temporary resource windfalls, should use higher savings today to mitigate the effects of potential future shocks. Boz, Cubeddu, and Obstfeld (2017) interpret the reserve accumulation by commodity exporters as a way for smoothing the use of the commodity windfalls. Succinctly, I suggest that the PIH is not only for smoothing consumption but also for smoothing investment in human capital and physical capital. Further, such economies could face investment constraints due to their dependence on exhaustible resources that adversely affect profitability and investment in the industrial sector, which has a greater investment capacity.

Other explanations for higher saving than investment could be related to self-financing motives and credit constraints in developing countries. Aizenman, Pinto, and Radziwill (2007) demonstrate that international financial integration has failed to offer net sources of financing capital to EMDEs. They show that up to 90% of investment is self-financed in EMDEs during the 1990s. Furthermore, Buera and Shin (2017) illustrate in a joint dynamic model for TFP, savings, and investment, with heterogeneous producers and financial frictions. When economy-wide reforms take place and remove distortions (mainly, taxes and subsidies), TFP initially increases with a larger saving response compared to a muted investment response. As a result, the net effect of more savings than investment could explain the pattern of net capital outflows from EMDEs.

Gourinchas and Rey (2015) discuss theoretical shortcomings in the neoclassical growth model, mainly its underlying assumptions. These include a homogeneous aggregate production function, a rational infinitely lived agent who maximizes the consumption path, and perfectly mobile capital across countries. They demonstrate an open-economy model with a broader law of motion capturing *wealth,* which only comprises the stock of physical capital and net foreign assets. The model in Gourinchas and Jeanne (2013) focuses on *financial* wealth by empirically controlling for initial capital abundance measures of physical capital and net external position. Their findings show the importance of capital account openness to dampen the allocation puzzle only for very highly growing EMDEs. Although the pattern of upstream capital flows still holds true, faster growing economies with higher degrees of financial openness have lower ratios of net capital outflows to GDP, relatively. Even though Gourinchas and Jeanne shed light on the importance of financial wealth, their definition of wealth is still very narrow and neglect the increasing role of natural resource-rich countries' in accumulating foreign reserves and their Sovereign Wealth Funds in the pre- and post-2008 GFC.

As discussed in the previous section, the recently available dataset on wealth accounts by the World Bank includes two more stocks of human capital and natural capital, allowing for a more comprehensive accounting of capital than by Gourinchas and Rey (2015). The share of these two stocks together accounts for the lion's share of wealth for almost all countries. Lucas' (1988) model illustrates a positive externality from human capital on the long-run economic growth. On the other hand, many studies on natural resources show negative effect from natural resource windfalls on the long-run growth rates (e.g., Sachs and Warner 2001).

The current study is also closely related to the wide literature on the natural resource curse that seeks to explain the relatively slower growth performance of resource-abundant countries. Some of these explanations are as follows: trade specialization in low-productive activity causing a deteriorating long-run term of trade; increasing the rent-seeking rather than productive investment resulting an overall poor quality of institutions, volatile international prices of exhaustible primary commodities deteriorate the public finance especially when having underdeveloped financial systems, etc. (e.g., Van der Ploeg 2011; Krugman 1981; Frankel 2012; Barbier 2007). Moreover, the Dutch disease model of Matsuyama (1992), based on an *open*-economy three-sector model with international trade specialization, demonstrates a negative link between the agricultural productivity and industrialization in the economic development process (Barbier 2007, pp.112-119). The Dutch disease effects (or the *deindustrialization* process) could be explained as in Van der Ploeg (2011, p. 377) as follows: during price booms or new discoveries of natural resources, export revenues could induce exchange rate appreciation and, hence, reduce the tradable non-resource sector competitiveness (i.e. the spending effect); and workers from the productive sector get attracted by higher wages in the resource sector and/or the non-tradable sector that have higher demand (i.e. the resource movement effect). Therefore, the tradable non-resource sector, which is more productive, shrinks in the long run. Another explanation of the resource curse is by Rodriguez and Sachs (1999). They illustrate that the unsustainable high income caused by a temporary resource windfall leads to unsustainable overconsumption and, hence, the convergence to the steady-state level occurs from above in an overshooting neoclassical growth model. This result emphasizes the implication of the PIH in the neoclassical growth model. In other words, the transitional dynamics to their steady-state level occurs from above along the saddle path, unless there is an exogenous technological change and/or allowing for international capital mobility. Interestingly, they acknowledge that by relaxing the assumption of imperfect capital mobility, countries could invest in international assets that pay permanent annuities which help them to avoid having unsustainable overconsumption levels. Besides, while Sachs and Warner (2001) show empirical evidence that the more resource-dependent a country was in 1970, the lower growth performance in subsequent two decades, Manzano and Rigobon (2001) attribute the slower growth performance of the 1980s-1990s to the debt-overhang argument. Many studies also highlight that volatile international commodity prices adversely affect counties' public finance, especially when the financial system is underdeveloped (Nili and Rastad 2007; Van der Ploeg and Poelhekke 2009, 2010). Furthermore, while Gylfason (2004) discuses indirect effects from natural abundance on growth through crowding out all other types of capital, I argue it could be also possible for crowding in effects for some types at least. For instance, Van der Ploeg (2011) demonstrates that diamonds account for about 40% of Botswana's GDP but the country has managed to turn the curse into a blessing. It has the world's highest growth rate since 1965, associated with the second highest expenditure on education as well as stable long-term investment exceeding 25% of GDP, (p. 368). All in all, these studies show there are many linkages between natural abundance, institutions, domestic financial system, NFA position which capture to some extent the public finance. Thus, I argue that the board definition of wealth by Gylfason will help us improve our understanding of an open-economy growth framework while studying the capital flow movements.

The last two decades show that resource-rich countries had remarkable accumulations of foreign assets, and were regarded as creditor countries on the contrary. As discussed, the accumulation of foreign assets allows such countries to protect their exchange rates from appreciating and helps them to smooth consumption as in the PIH. Also, such countries could pursue an industrial policy by investment in human capital using resource rents. Accordingly, the current study attempts to make a synthesis of two branches of the wide literature on open-economy macroeconomics, comprising the sustainable development and capital flows. Both are mostly discussed within the neoclassical growth theory, but the broad definition of wealth will make the difference.

1.4 Conceptual Framework and Correlations

In this section, I begin with a conceptual framework that links theoretical insights of different growth models to capital flow movements. Before turning to the empirical analyses, I also present preliminary *unconditional* correlations to motivate the study that considers the role of wealth composition in capital flows patterns in the recent period.

1.4.1 Conceptual Framework

This study focuses on the supply side of the economy as in the neoclassical growth model to explain international capital flows during the convergence process. The open-economy model illustrated in Gourinchas and Jeanne (2013) considers the accumulation of *wealth,* but their definition of wealth is very limited. I attempt to extend their model by introducing a broader definition of wealth. Gourinchas and Jeanne present an open-economy neoclassical model with an initial abundance of both physical capital stock and net external debt stock (or NFL) in a developing economy. They argue that productivity growth in developing countries would catch up to some fraction of that in the US, which is considered as the technological frontier. Thus, during the catching-up process, EMDEs would grow faster and attract more foreign capital inflows due to diminishing returns to capital. This is known as the efficient allocation hypothesis—a positive association between productivity growth and net capital inflows. Thus, each type of capital should grow at a faster rate during the catching-up process and then at a similar rate to the growth in income per efficiency unit in the period (T). Accordingly, they define the initial capital abundance measure by ratios of physical capital and debt level to the GDP level.

I extend the open-economy standard growth model by defining wealth more broadly. While the World Bank's definition of wealth consists of four capital types (Lange, Wodon, and Carey 2018), a broader definition is also found in Gylfason (2004). Therefore, I will adopt the latter definition of wealth that comprises six types of capital, depicted in Figure 1.1A, so the model (in per capita unit) becomes as follows:

$$y_{it} = f_{it}(w_{it})$$

Where:

$$w_{(it)} = k_{Physical_{(it)}} + k_{NFA_{(it)}} + k_{Human_{(it)}} + k_{Natural_{(it)}} + k_{social_{(it)}} + k_{Financial_{(it)}} \quad (1.8)$$

And the subscript (it) refers to a country and year, respectively.

It would be implausible to assume all countries achieve their balanced growth paths (BGP) by the end period of the study. Gourinchas and Jeanne (2013) assume that all countries achieve that in 2000, the end period of their sample. Unlike the standard neoclassical growth model, by including natural capital I can investigate the implication of natural resource management. For Gylfason (2004), natural abundance has not only a direct negative effect on growth but also an indirect effect through *crowding out* other types of capital. By contrast, there are some successful, highly-growing, resource-abundant countries such as Botswana which were able to enhance human capital, and United Arab Emirates that diversified its economy into light manufacturing, telecommunications, finance, and tourism (Van der Ploeg 2011). These facts show the possibility of *crowding in* effects, too. Accordingly, I assert that the *indirect* effects of resource abundance are ambiguous. Figure 1.1B illustrates the direct and indirect effects of natural capital abundance.

Therefore, different types of capital interact with an overall ambiguous net effect on growth. Nevertheless, since many EMDEs are associated with fast-growing economies, I could justify the use of the initial abundance of wealth for a better understanding of capital flow movements. I define the abundance measures similar to Gourinchas and Jeanne (2013) but for all types of capital stocks. Barbier (2007) discusses a debate in the sustainable development literature about whether capital stock types could be substitutes or not. The *strong* sustainability argument states that *each type* of capital stock must be non-decreasing, while the *weak* sustainability argument states that the *total wealth* must be non-decreasing. Accordingly, I must assume for the weak sustainability that is the minimum requirement of sustainable economic growth.

In contrast to the crowding-out effects as in Gylfason (2004), I believe that in the current era of financial globalization, policymakers in resource-abundant countries have been accumulating NFA and allocating large shares of their annual budgets toward education, among other things. Thus, one could argue that financial globalization has allowed policymakers in EMDEs to channel the resource rents to higher accumulation of NFA. This might help mitigate the Dutch disease effects by preventing the real appreciation in exchange rates, and to smooth the

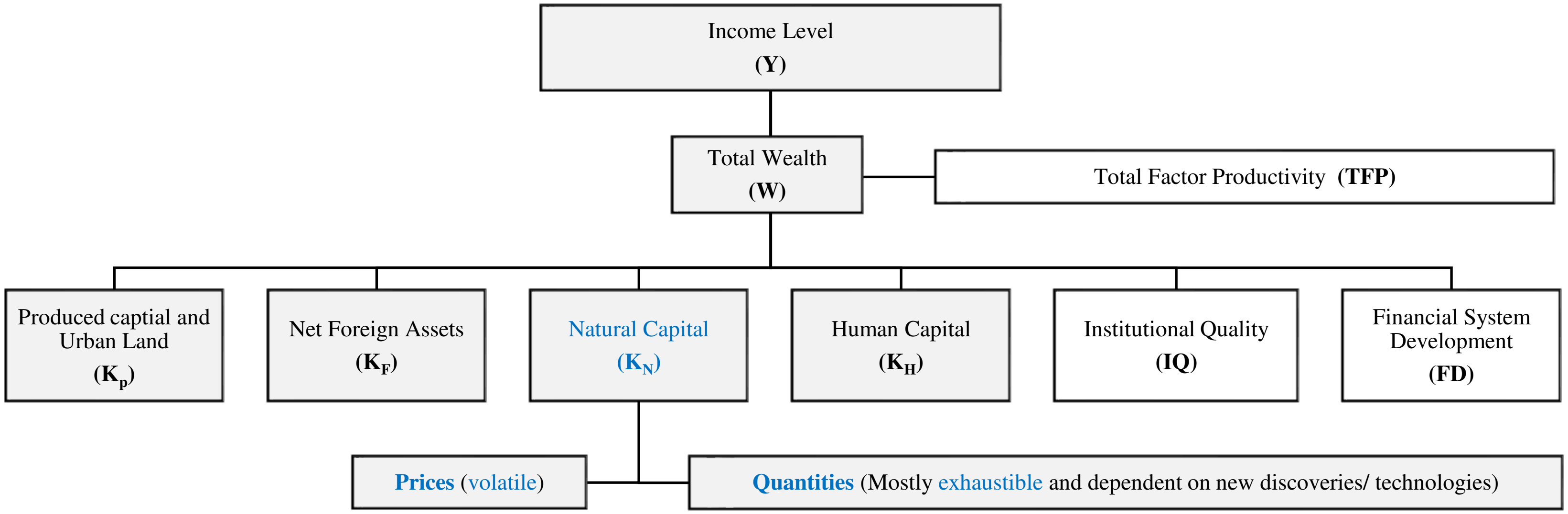


Figure 1.1A: Sustainable development requires non-decreasing per capita total wealth over time

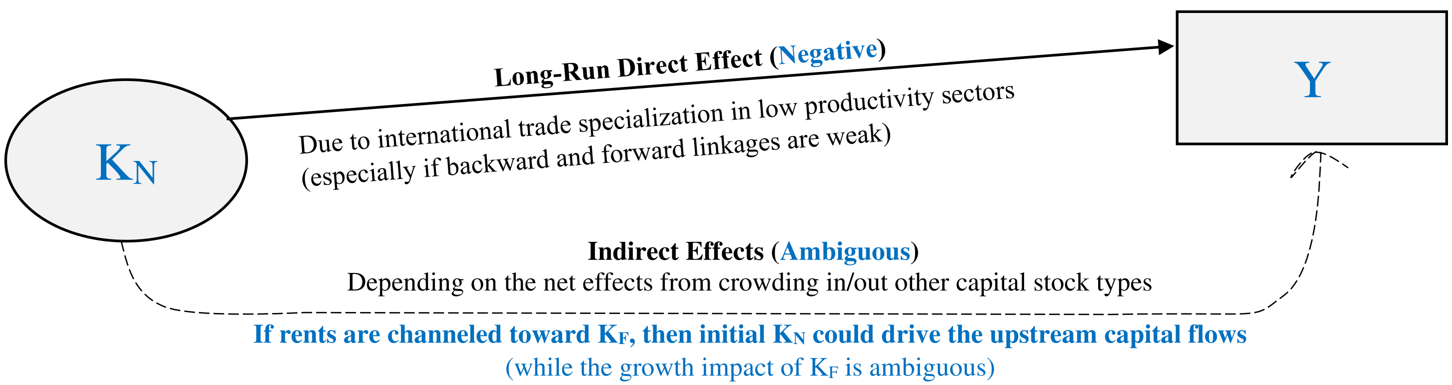


Figure 1.1B: The direct and indirect effects of natural capital on income and international capital movements

use of natural resource windfalls. As discussed in the literature review section, I suggest that PIH is not only about smoothing consumption but also smoothing investment in human capital and physical capital. Accordingly, NFA management is crucial in which K_N could crowd in K_F in the development process.

Although the above is an extended supply-side framework, the demand-side channels could be of importance, too. Many previous studies illustrate that investment and savings have different degrees of responsiveness to income increases. First, with habit formation in consumption preferences, Carroll, Overland, and Weil (2000) show that an increase in income growth can cause increased savings. Second, Buera and Shin (2017) illustrate in a joint dynamic model that when economy-wide reforms correct for distortions (mainly, taxes and subsidies), TFP initially increases with a larger saving response than a muted investment response. Nevertheless, these complications are beyond the focus of the current study.

Besides, I highlight the importance of natural capital in studying international capital flow movements. This is because per capita GDP is an erroneous measure of welfare especially in the context of cross-country comparison. For instance, Stauffer and Lennox (1984), whose study was commissioned by OPEC, state, “The GDP of oil-exporting states is exaggerated because some of their income is due to the consumption of depletable oil resources and hence is liquidation of capital, not income.’’ (as cited in Neumayer 2004, p. 1630). Consequently, the modified model illustrated in equation (8) will allow for a better understanding of capital flow patterns.

Rodriguez and Sachs (1999) acknowledge that the resource curse explained by the unsustainable overconsumption argument could be avoided through investment in international assets that pay annuities. For them, relaxing the assumption of imperfect capital mobility across countries could turn the conclusion of the resource curse upside down. In addition, the policy implications of the resource-growth relationship suggest the use of a policy mix of reserve accumulation and industrial policy (Polterovich, Popov, and Tonis 2010). While the former helps protect the competitiveness of the existing tradable production, the latter puts emphasis on the manufacturing sector that generates sustainable higher growth rates. Therefore, the reserve accumulation policy by resource-rich countries could be a major driver of the upstream capital flows phenomenon.

My main hypothesis, hence, is that a higher initial abundance of subsoil-type natural capital could explain much of the subsequent capital flows, as shown figure 1.B. I expect a negative relationship between subsoil resource abundance in 1995 and the annualized average net capital inflows over the subsequent two decades. The second hypothesis is about the global imbalance phenomenon. Net creditor countries in 1995 tend to be associated with a subsequent annual average of net capital *outflows*. In line with previous studies, I do not expect the efficient allocation hypothesis to hold. I expect a significant and negative, rather than positive, association between the annual averages of real per capita growth and net capital inflows (e.g., Gourinchas and Jeanne 2013; Prasad et al. 2007).

Before turning to the empirical investigation, I should acknowledge the following limitations. First, data availably restricts the analysis to begin in 1995. Second, per capita growth rates and capital stocks of different types are endogenous variables. I will, therefore, consider initial abundance measures in 1995, while investigating the allocative efficiency hypothesis over the subsequent annual averages during 1996-2015.

1.4.2 Preliminary Unconditional Correlations

Before 1995, EMDEs were still under the progress of capital account liberalization, as discussed in previous sections, and have been associated with different degrees of openness. In addition, EMDEs have experienced relatively high growth performance during the last few decades. Figure 1.2 shows that less developed economies, in terms of per capita income, were still associated with lower degrees of capital openness in 1995. Figure 1.3 shows that countries with lower per capita incomes in 1995 were associated with subsequently higher growth rates averaged over 1996-2015, reflecting a period of *convergence*.[9] Indeed, this contrasts with the widening divergence, at the time of Lucas' (1990) writing, in which rich economies displayed higher growth. Moreover, Figure 4 shows the correlation of the two main measures of net capital inflows averaged over 1996-2015, against per capita real GDP in 1995. These measures are the negative CA and the change in the NFL. Panels (a) shows a negative association between initial per capita incomes and subsequent net capital inflows. By contrast, panel (b) shows that the incorporation of valuation effects produces a flatter slope, making it difficult to draw a preliminary conclusion. All in all, these unconditional correlations illustrate the importance of relatively varying degrees of liberalization of capital accounts, relatively higher growth rates in many EMDEs compared to advanced countries, and the measure choice of net capital flows.

Figure 1.5 is about the association between net capital inflows and growth rates averaged over 1996-2015. Such an association is used to investigate the efficient allocation hypothesis as implied by the neoclassical growth theory. Both measures show inclusive preliminary evidence on either the neoclassical efficient allocation or Gourinchas and Jeanne's (2013) allocation puzzle.

[9] CHN refers to China which seems a potential outlier.

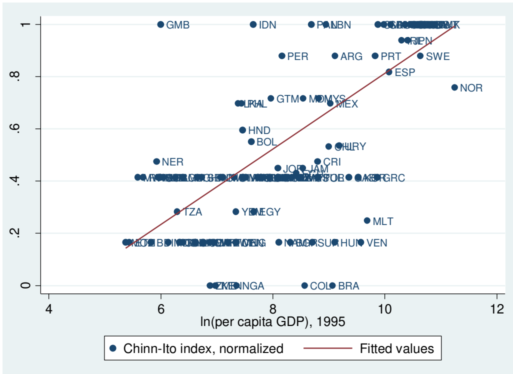


Figure 1.2: The correlation between capital openness and per capita GDP levels, 1995

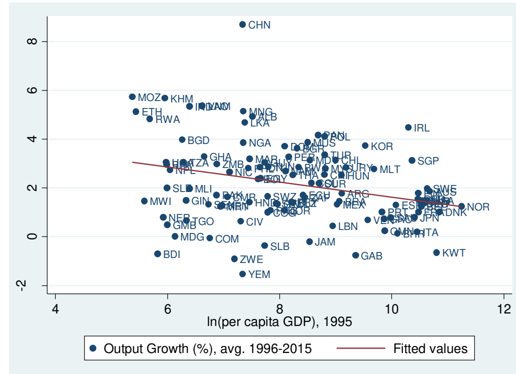
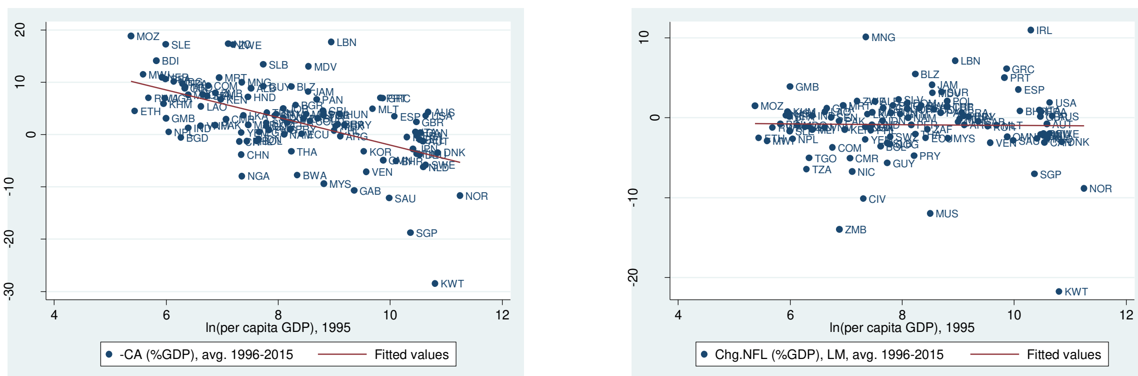


Figure 1.3: The correlation between 1995 per capita GDP levels and growth rates averaged over 1996-2015



(a) –CA (%GDP), avg. 1996-2015 (b) ΔNFL (%GDP), avg. 1996-2015

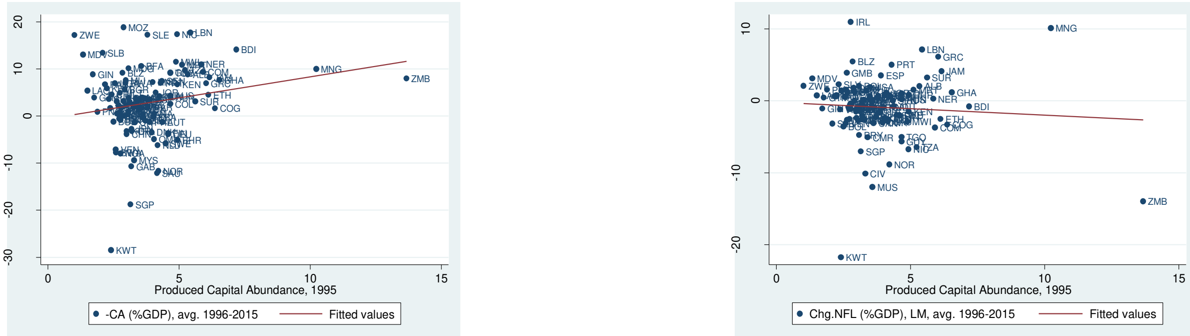
Figure 1.4: Net capital inflows during (1996-2015) against per capita GDP in 1995

(a) –CA (%GDP), avg. 1996-2015 (b) ΔNFL (%GDP), avg. 1996-2015

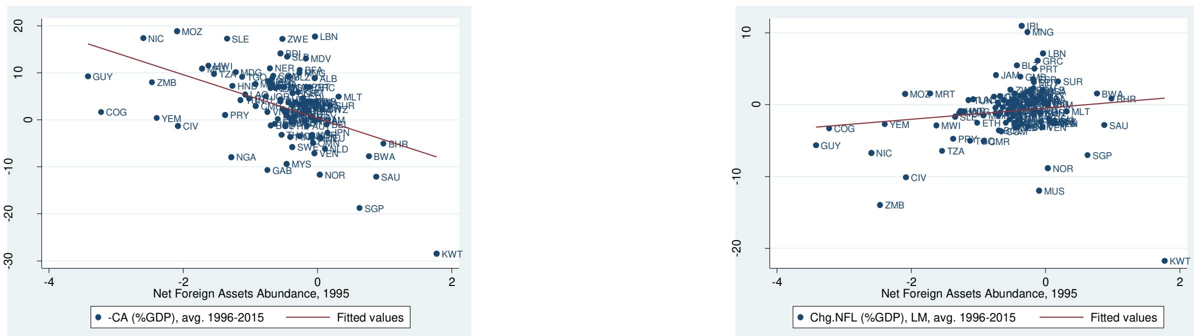
Figure 1.5: The correlation between net capital inflows and real growth rates, avg. 1996-2015

Figure 1.6 focuses on the initial wealth abundance measures and their associations with the subsequent annualized average of net capital inflows over 1996-2015. First, the NGM implies that there is a negative association between the initial produced capital abundance and the subsequent annualized average net capital inflow due to the diminishing returns. In turn, there should be a negative association between the initial level of produced capital abundance and net capital inflows which exploit higher returns. The slope changes across the two measures of net capital inflows, but the density of observation makes it difficult to draw an unconditional relationship. Second, the NGM predicts that due to physical capital scarcity, EMDEs would start with higher debt levels (negative NFA positions) to exploit higher returns. There should be, therefore, a negative association between initial NFA abundance and subsequent net capital inflows during the convergence process. Although the correlation on the left in panel (b) of Figure 1.6 seems to validate such a prediction, the correlation on the right shows the opposite relationship.[10] In addition, panel (c) of figure 6 considers the role of human capital as emphasized by Lucas (1990). He argues for a positive correlation between human capital and capital inflows. However, both correlations show a negative slope, which raises concerns over the method of estimated human capital while controlling for income distribution dynamics across countries.[11] Moreover, since the main contribution of the study is with the emphasis on the role of natural capital, panel (d) depicts the correlation against net capital inflows. Resource-rich countries could deplete stocks in order to accumulate international foreign reserves, as an

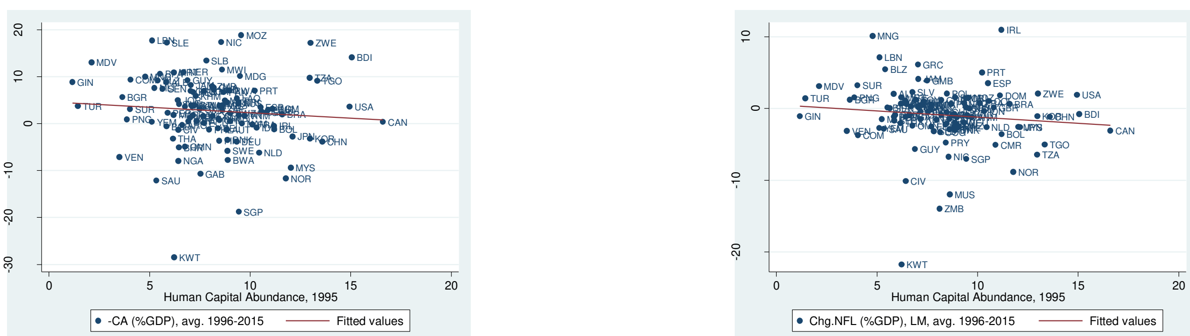
[10] Put differently, countries with initial CA surpluses have, on average, continued to associate with CA surpluses over the next two decades.
[11] The calculations of expected-lifetime earnings seem to be a good measure for human capital while assuming skills are embedded in higher wages. However, for cross-country context, I argue that income distributional dynamics could not be captured in that way especially in such a globalization era with the global value chains.



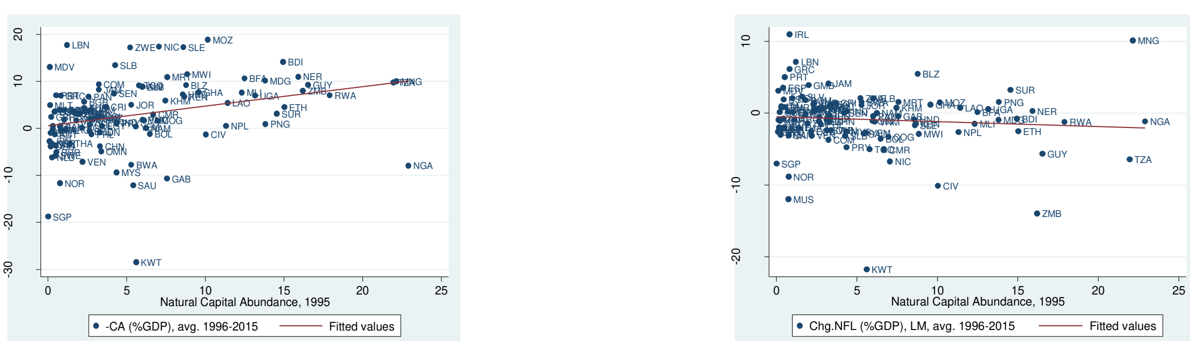
a) Produced capital and Urban Land



b) Net Foreign Assets



c) Human Capital



d) Natural Capital

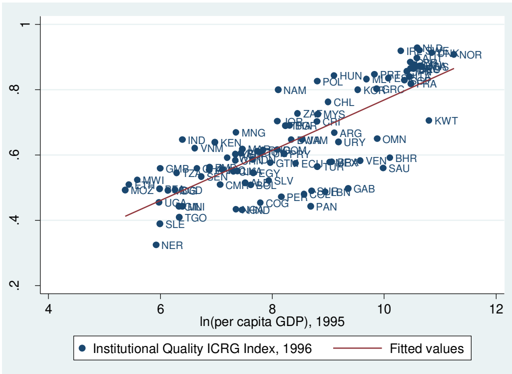
Figure 1.6: Net capital inflows over 1996-2015 against initial capital abundance measures

explanation of the upstream capital flows. Hence, I expect a negative association between initial natural capital abundance and subsequent net capital inflows.

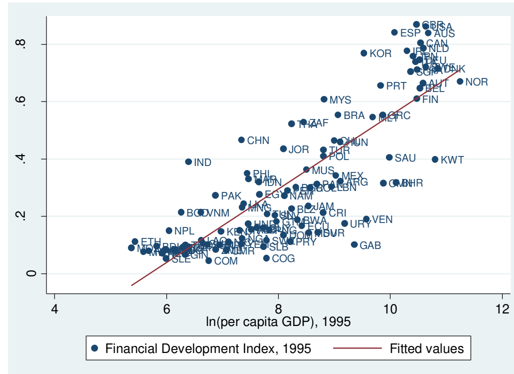
Interestingly, panel (d) of Figure 1.6 shows that only the first correlation is in line with that prediction, while the valuation effects, incorporated in the second measure, turn the correlation upside down.[12] This might also be due to the composition of natural capital which will be taken into consideration in the regression analysis. In sum, Figure 1.6 shows that the measure choice for net capital inflows matters when we investigate the role of wealth composition.

Following the broader definition of wealth by Gylfason (2004), I supplement the World Bank data by composite indexes of institutional quality and financial development. Figures 1.7 shows that these indexes associate with higher values for more developed economies, consistent with our prior expectations. Figure 1.8 shows the correlation between natural resource abundance (per types) and these two indexes. Overall, resource-abundant countries are associated with underdeveloped institutions and financial systems, validating the consensus of the natural curse literature (e.g. Van der Ploeg 2011; Van der Ploeg and Poelhekke 2009). These correlations suggest that we should think carefully about a multicollinearity problem in the regression analysis later.

[12] It should be noted that the country *Liberia* is already dropped because it seems an obvious influential observation (i.e. It has the impact of both outlier and leverage). Dropping this country also allows for such clear representation of the figures 2-6.

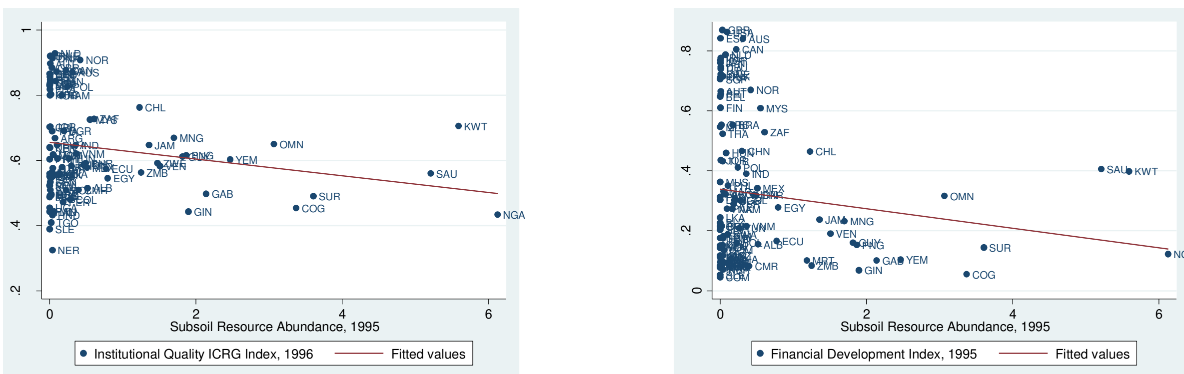


a) The correlation between institutional quality and real per capita GDP, 1996

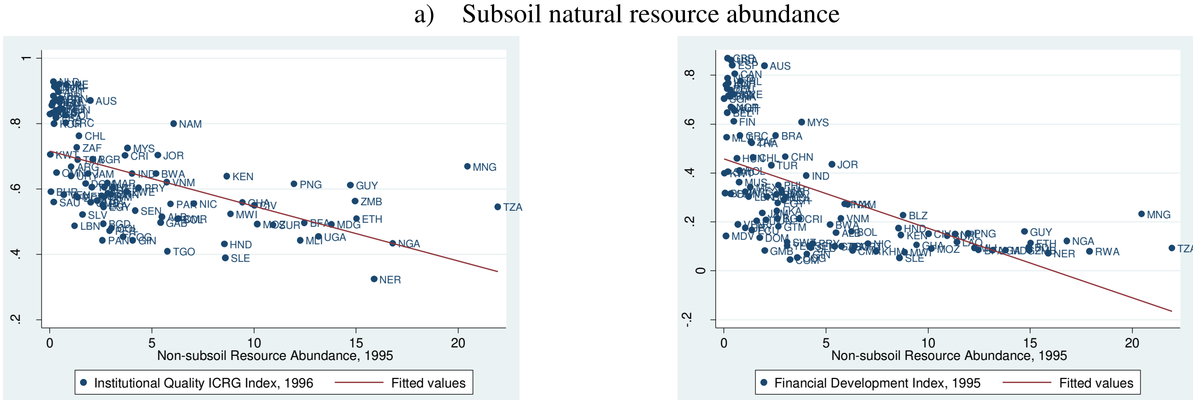


b) The correlation between financial development and real per capita GDP, 1995

Figure 1.7 The correlation of income levels against institutional quality and financial development



a) Subsoil natural resource abundance



b) Non-subsoil natural resource abundance

Figure 1.8: The correlation of initial natural resources against institutional quality and financial development

1.5 Data and Empirical Approach

The objective of this paper is to investigate the role of wealth composition on the medium-term pattern of capital flows, while revisiting the efficient allocation hypothesis. Accordingly, I attempt to answer the following questions. Does the composition of wealth matter in explaining capital flows? Could the abundance of natural resources, which is neglected by previous studies, help for a better understanding of capital flow movements? More specifically, does the disaggregation of natural resources matter? The main hypothesis is that capital mobility allows resource-abundant countries to save more today (accumulate in the form of NFA).

Thus, this section starts off with a brief discussion on data sources, followed by descriptive statistics. Next, it introduces an empirical strategy, and shed light on some challenges and possible robustness checks.

1.5.1 Data Sources and Summary Statistics

In this paper, I use data from different sources for measures of net capital inflows over 1996-2015. Particularly, I rely on Alfaro et al. (2014) updated and extended database version and Lane and Milesi-Ferretti's (2017) dataset. First, the data on CA balances are available at the IMF International Financial Statistics (IFS) but only reported for a short period of time. That is, data are available but only for the years reported based on the latest Sixth Manual of the Balance of Payment (BPM6). For a longer period of analysis, Alfaro et al. have supplemented the IMF BPM6's data with the previous data reported based on the BMP5, while considering sign convention changes between the two manuals. Second, they also incorporate Official Development Assistance (ODA) aid flows from the OECD-Development Assistant Committee (DAC). By adding the ODA net aid flows to the reverse sign of CA variable, I construct the second measure as in equation (1.5). Furthermore, the measure that incorporated valuation effects, as in equation (1.7), is constructed from the data on NFA estimated by Lane and Milesi-Ferretti (2007, 2017).

Other data sources are as follows: population and real GDP from the World Bank-World Development Indicators (WB-WDI), sub-indicators of institutional quality are from the Political Risk Services- International Country Risk Guide (ICRG) database, a composite index of financial system development from Svirydzenka (2016), a *de jure* capital account openness index from the updated dataset of Chinn and Ito (2006). The indexes range between zero and one, with greater values for higher degrees of developed financial systems and openness to foreign capital flows. Using the ICRG data, I constructed an average-weighted index for institutional quality using these six sub-indicators: 1) voice and accountability, 2) political stability and absence of violence, 3) government effectiveness, 4) regulatory quality, 5) rule of law, and 6) control of corruption. Finally, and most importantly, the recently released data on wealth are from the World Bank-Wealth Accounts (WB-WA) database.

Table 1.3 reports the descriptive statistics, while a pair-wise correlation matrix is reported in the appendix Table C3. It should be noted this study considers economies of different sizes, so all variables must be in per capita units. Moreover, the 1995 capital abundance measures are defined as the per capita stock of each capital type divided by per capita GDP.[13] First, and interestingly, the sample means of the alternative measures of net capital inflows show different signs, showing the important role of aid flows and valuation effects as discussed in section 1.2.1. Second, data show large cross-country differences, especially for the initial natural capital abundance ranging from a ratio of zero to 22.92.[14] Furthermore, an average country in the sample

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[13] Since real per capita GDP data are in constant 2010 USD while wealth measures are in constant 2014USD, I adjust the base year of the former to 2014 for consistency.

[14] In fact, an influential country, Liberia, is dropped from the sample because of an initial value of natural capital abundance of 72.49.

associates with a capital openness index at 0.52 and financial system development index at 0.32 in 1995, reflecting large variations across countries. Similarly, for the institutional quality index, the mean is at 0.64 in 1996, the first year of data availability. In addition, it could be seen remarkable variations in the other explanatory variables, including per capita real growth rates, population growth rates, and the decomposed natural resource abundance measures along with other wealth measures. These variables capture county-specific conditions with regard to capital flows.

Following the natural resource literature that emphasizes different implications of different types of resources, I also differentiate between different types of natural capital endowments. Barbier (2007) demonstrates that some studies on the resource curse literature show that countries with a higher endowment of *subsoil* resources had on average slower

Table 1.3: Descriptive Statistics

Variable	N	Mean	SD	Min	Max
Measures of net capital inflows					
-CA (%GDP), avg. 1996-2015	108	2.78	7.29	-28.48	18.88
ΔNFL (%GDP), avg. 1996-2015	108	-0.88	4.14	-21.73	10.95
-CA+ODA (%GDP), avg. 1996-2015	108	6.27	11.07	-28.47	38.25
The set of explanatory variables					
Real per capita growth (%), avg. 1996-2015	108	2.18	1.69	-1.53	8.7
Population growth (%), avg. 1996-2015	108	2.35	2.70	-1.13	15.70
KA Openness Chinn-Ito Index, 1995	108	0.52	0.31	0	1
Initial wealth abundance measures					
Produced Capital Abundance, 1995	108	3.78	1.66	1.01	13.67
Net Foreign Assets Abundance, 1995	108	-0.52	0.76	-3.42	1.78
Human Capital Abundance, 1995	108	8.17	2.75	1.16	16.6
Natural Capital Abundance, 1995	108	5.31	5.38	0	22.92
Subsoil Resource Abundance, 1995	108	0.53	1.14	0	6.13
Non-subsoil Resource Abundance, 1995	108	4.78	5.14	0	21.94
Additional explanatory variables					
Financial Development Index, 1995	107	0.32	0.24	0.05	0.87
Institutional Quality ICRG Index, 1996	96	0.64	0.15	0.32	0.93

economic growth than those with a higher endowment of *non-subsoil* resources (p. 118). In this study, I define these types using the WB-Wealth Accounts dataset as follows. While subsoil resources include fossil fuel energy, minerals, and metals, non-subsoil resources comprise agricultural land, pastureland, forests, and protected areas.

Table 1.4 considers the measures of annualized averages of net capital inflows and real per capita growth, and initial natural capital abundance of different country groups based on income and region. The list of country groups is reported in the appendix in Tables A1 and A2. Data show that the measures of capital flows associate with different signs, and different types of natural capital seem to play an important role too. For instance, while high-income, *non-OECD* countries are associated with the highest subsoil abundance, they display the largest net capital outflows associated with slowest growth rates. While OECD countries lack natural capital, other low-to-middle income countries are associated with the highest abundance of non-subsoil natural

Table 1.4: Country Group Comparison, selected variables

Group	g_y	-CA	ΔNFL	-CA +ODA	$\frac{K_N}{y}$	$\frac{Subsoil}{y}$	$\frac{non-subsoil}{y}$
		(%GDP)					
	Average (1996-2015)				(1995)		
By Income							
High income: OECD	1.78	-0.26	0.03	-0.25	0.63	0.12	0.51
High income: non-OECD	1.30	-7.76	-4.23	-7.59	2.16	1.77	0.39
Upper middle income	2.65	3.05	0.66	4.38	4.45	0.48	3.97
Lower middle income	2.35	3.69	-1.89	8.45	7.18	0.73	6.44
Low income	2.13	9.66	-1.12	20.22	10.85	0.19	10.66
By Region							
East Asia & Pacific	3.43	-0.10	-0.64	3.58	5.53	0.38	5.15
Europe & Central Asia	2.02	0.46	0.54	0.70	0.94	0.08	0.85
Latin America & Caribbean	2.08	3.65	-0.39	5.66	4.64	0.54	4.10
Middle East & North Africa	1.07	-1.44	-1.74	-0.29	3.25	1.63	1.62
North America	1.49	2.01	-0.60	2.01	0.60	0.16	0.44
South Asia	3.60	3.31	-0.08	5.49	4.51	0.08	4.43
Sub-Saharan Africa	1.91	6.38	-2.08	14.10	9.54	0.60	8.94

Sources: the author's calculations using data from WB-WA, WB-WDI, LM (2017), following the World Bank classification by region and income as of 2014 capital. In sum, it is of importance to investigate capital movements by comparing different measures of capital flows and disaggregated natural capital.

1.5.2 Empirical Approach

To investigate the long-run pattern of capital flows, I adapt the empirical specification of Gourinchas and Jeanne (2013), motivated by the growth accounting literature. They assume that returns to physical capital are equalized across countries if measured appropriately, relying on the findings of Caselli and Feyrer (2007), who correct for natural resources and price differences. Caselli and Feyrer also support the argument of Lucas about endowment complementarity (as in human capital) rather than credit frictions in driving international capital movements. Drawing on the development accounting literature conclusions that the long-run cross-country differences in growth are explained by differences in their total factor productivity (TFP), not their factor supply, Gourinchas and Jeanne (2013) assert that initial abundance measures are constant along the balanced growth path. Furthermore, countries with higher productivity growth should invest more, which implies higher returns to capital, and hence they should associate with net capital inflows. Thus, they focus on the association between net capital inflows and productivity growth, while controlling for the degree of financial openness, population growth, and initial capital abundance measures. The latter of which include only the initial physical capital-to-output ratio ($k_{p,i}/y_i$) and the initial debt-to-output ratio (d_i/y_i). However, I emphasize that that initial capital abundance could still play a significant role, especially with the broader definition of wealth in the current study.

I extend Gourinchas and Jeanne's (2013) empirical specification to consider six initial abundance measures of capital. I also attempt to mitigate concerns over endogeneity, due to simultaneity bias, by controlling for lagged initial capital abundance measures in 1995 to avoid the reverse directional effect from capital flows to the accumulation of capital measures. Instead of TFP growth, usually attributed to human capital in previous studies, I emphasize the role of endowment complementarity (as in Caselli and Feyrer 2007) between all types of capital stocks, and hence focus on the real growth in per capita GDP. Therefore, I could test the allocative efficiency hypothesis through the partial *conditional* correlation between net capital inflows and real growth, averaged over 1996-2015. By doing so, I will also be able to answer how the cross-country differences of wealth composition in 1995 explain the subsequent annualized average of net capital flows during 1996-2015. Accordingly, I suggest starting with the following *main* specification:

$$\left(\frac{\mathrm{Inflows}}{\mathrm{y}}\right)_{\mathrm{avg.1996-2015,\,i}} = \alpha + \beta_1 \cdot \left(\frac{k_P}{y}\right)_{1995,i} + \beta_2 \cdot \left(\frac{k_F}{y}\right)_{1995,i} + \beta_3 \cdot \left(\frac{k_H}{y}\right)_{1995,i} + \beta_4 \cdot \left(\frac{k_N}{y}\right)_{1995,i} + \beta_5 \cdot (g_{n.})_{\mathrm{avg.1996-2015,\,i}} + \beta_6 \cdot (g_y)_{\mathrm{avg.1996-2015,\,i}} + \varepsilon_i \qquad (1.9)$$

Next, I consider the inclusion of the composite indexes of institutional quality and financial system development, the specification of which I call the *full* specification. [15] The reason for having two specifications is threefold. First, unlike the *stock* wealth measures by the World Bank, these are indexes calculated to range between zero and one. Second, data availability decreases the sample size from 108 to 95 economies. Third, and more importantly, because of the high correlations of these indexes with the abundance of natural resources, as discussed in Figure 8, I could have a multicollinearity problem. Therefore, there are estimator tradeoffs between unbiasedness and efficiency that I need to think about carefully.

[15] While data on a composite index of financial system development are available in 1995, data on institutional quality starts from 1996. I believe this data restriction would not be problematic since institutional quality changes slowly over time and, hence, using the year 1996 as initial year should not make a notable measurement error bias to the regression estimates.

It should be noted that I run equation (1.9) three times because of the three measures of net capital inflows, as discussed in section 1.2.2. This way allows us to disentangle commonalities and differences across the measures. All regressions are run with White heteroscedasticity-consistent standard errors that address the possible heteroskedasticity due to economy-size differences.

1.5.3 Robustness Checks

After conducting the main regression analysis, I will run a battery of robustness checks. First, the period of study during 1995-2015 is characterized by many volatile episodes of capital flows which might have caused a structural change in the relationship. Such episodes include the 1997 Asian financial crisis, the 2001 dot-com bubble, 2008-9 Global Financial Crisis (GFC), followed by the European sovereign debt crisis and finally the 2013 FED taper-tantrum. All of which are believed to impact certain types of capital flows, except for the GFC that could have a possible structural change to the net (total) capital inflows. Therefore, I test for a structural change due to the 2008-09 GFC, using a dummy-variable technique. Second, the allocation puzzle argument by Gourinchas and Jeanne (2013) is, in fact, on a sample of *EMDEs*, so I exclude OECD countries. Third, due to the relative importance and characteristics of China and India, I also drop them too. Fourth, I exclude potential influential observations, identified by informal and formal statistical tests. In addition, instead of the ordinary least square regression, I run robust and quantile regression analyses. The robust regression analysis uses iteratively reweighted least-squares based on Cook's Distance method in which lower weights are assigned to observations with values greater than one. The quantile regression is based on minimizing the least absolute deviations from the median.[16] Next, I run an OLS regression with fixed effects for

[16] The quantile regression is also known as a Least Absolute Deviations (LAD) regression.

income and regional groups to control for unobserved heterogeneity. Finally, due to our concern about the measure of human capital wealth, I use average years of schooling as in Barro and Lee (2013).

1.6 Results

This section starts off by reporting the regression estimates of the main specification sample, which consists of 108 countries.[17] Then, I report the regression estimates with regard to the robustness checks.

1.6.1 Regression Estimates

The main contribution of the current study is to highlight the role of natural resource abundance, particularly its decomposition into the subsoil and non-soil types, in explaining the variations in the subsequent average of net capital inflows. Table 1.5 reports the *main* specification estimates using the three measures of net capital inflows.[18] First, the initial abundance of subsoil resource abundance enters with a significantly negative coefficient, whereas non-subsoil resource abundance associates with a positive coefficient (as in columns 1 and 3). Interestingly, the measure ΔNFL (as in column 2) show that there is an important role of the valuation effects, as these two coefficients turn to become no longer statistically significant. This could be interpreted that the valuation effects mute the impact. Moreover, while the measures in columns 1 and 3 show there is evidence on the negative association between the initial abundance of net foreign assets and subsequent net total capital inflows, column 2 shows the reverse in the sign which is significant because of the role of valuation effects. This implies that only by ignoring the valuations effects, I find supporting evidence on the role of natural

[17] Liberia is the only country that I have excluded. It seems an obvious influential observation as could be identified by both informal and formal statistical checks.
[18] Table 1.5 considers the decomposition of natural capital into two types. By contrast, using the *aggregate* natural resource abundance produces meaningless estimates as shown in the appendix Table A5.

resources and the persistence of global imbalance. Thus, countries with CA surpluses in the past (reflected in higher NFA positions) have continued to be associated with subsequent net capital *outflows* (or CA surpluses). Besides, estimates of the three measures show no evidence on the neoclassical efficient allocation hypothesis, captured by the insignificant coefficient on the real per capita growth.

In addition, there is weak evidence on human capital abundance but with a negative sign, only with the second measure regression (column 2 of Table 1.5). Nevertheless, that raises concerns over the use of this measure of human capital in a cross-country context. That is, it is based on households' discounted life-time expected earnings, which I argue that it captures labor cheapness rather than skills in a cross-country context. Accordingly, I could interpret the negative coefficient as follow: all else being equal, semi-industrialized countries with lower expected lifetime earnings are associated with a subsequent annual average of net capital *outflows* over average.[19]

Besides the statistical significance, I should identify the economic significance which matters for policymaking. The estimates in column (1) suggest that an increase by one standard deviation (1.14) in the initial abundance of subsoil resources, *ceteris paribus*, associates with a reduction in the ratio of subsequent annual average net capital inflows to GDP by 3.61 percentage points over the next two decades. Put differently, all else being equal, an increase in the initial abundance of subsoil resources from the 25th percentile to 75th percentile associates with a reduction in the ratio of subsequent annual average net capital inflows to GDP by about

[19] I validate the normality of residuals using a kernel density plot. I also find that there is no indication of multicollinearity in this main specification as suggested by the values of variance inflation factors (VIF) and condition indices (CI). Following the role of thumps discussed by Gujarati and Porter (2009, pp. 337-342), I find that no value of VIFs and CIs exceed 5 and 20, respectively. Therefore, there should be no concern about multicollinearity in the main specification. All of which suggest that we could draw inferences from the estimates.

1.29 percentage points. That is a decrease of net capital inflows equivalent to about 41% of the sample median. By contrast, an increase by one standard deviation (5.l4) of the initial abundance of non-subsoil resources associates with an increase in the ratio of subsequent annualized average net capital inflows to GDP by about 1.37 percentage points. In sum, these results validate the main hypothesis of the current study about the role of natural capital abundance per type.

Table 1.5: Estimates of the Main Specification

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.286	-0.102	0.393
	(0.396)	(0.459)	(0.500)
Net Foreign Assets Abundance, 1995	-2.945***	1.041	-4.674***
	(0.867)	(0.865)	(1.293)
Human Capital Abundance, 1995	-0.413	-0.340**	-0.391
	(0.256)	(0.136)	(0.307)
Subsoil Resource Abundance, 1995	-3.171***	-0.986	-4.062***
	(0.496)	(0.701)	(0.709)
Non-subsoil Resource Abundance, 1995	0.268***	0.0821	0.786***
	(0.0910)	(0.117)	(0.142)
KA Openness Chinn-Ito Index, 1995	-4.469**	0.101	-4.833*
	(2.106)	(1.329)	(2.476)
Real per capita growth (%), avg. 1996-2015	-0.460	0.165	-0.621
	(0.406)	(0.249)	(0.574)
Population growth (%), avg. 1996-2015	0.103	-0.206	0.586*
	(0.171)	(0.169)	(0.297)
Constant	6.993**	3.029	6.403*
	(2.788)	(2.140)	(3.700)
Observations	108	108	108
R-squared	0.511	0.141	0.614

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Next, Table 1.6 introduces two more components of wealth, following Gylfason's (2004) definition of wealth, which are not available in the World Bank-Wealth Accounts dataset. These are social capital and domestic financial capital, both of which I proxy for using indexes of financial system development and institutional quality. The joint test for the inclusion of both variables results in a p-value for the F-test at 0.0375, suggesting to some extent the relevance of these variables to the model on the one hand. On the other, I could have a multicollinearity problem as highlighted through the correlations depicted in figure 1.8. Nevertheless, regression estimates with the inclusion of these variables remain qualitatively unchanged with regard to our

Table 1.6: Estimates after the inclusion of institutional quality and financial development

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.695*	-0.0131	0.933*
	(0.417)	(0.551)	(0.498)
Net Foreign Assets Abundance, 1995	-2.601***	1.080	-4.173***
	(0.873)	(0.918)	(1.324)
Human Capital Abundance, 1995	-0.470**	-0.444***	-0.490*
	(0.212)	(0.161)	(0.255)
Subsoil Resource Abundance, 1995	-3.166***	-1.091	-3.929***
	(0.376)	(0.695)	(0.524)
Non-subsoil Resource Abundance, 1995	0.206**	0.0418	0.661***
	(0.101)	(0.135)	(0.134)
KA Openness Chinn-Ito Index, 1995	-0.730	-0.0156	1.019
	(1.802)	(1.339)	(2.268)
Real per capita growth (%), avg. 1996-2015	-0.0494	0.346	0.0119
	(0.359)	(0.287)	(0.507)
Population growth (%), avg. 1996-2015	-0.235	-0.234	0.0618
	(0.227)	(0.216)	(0.365)
Institutional Quality ICRG Index, 1996	-14.02**	-5.038	-15.23**
	(5.905)	(4.827)	(7.014)
Financial Development Index, 1995	1.775	3.466	-1.014
	(4.088)	(3.377)	(5.278)
Constant	12.07***	5.605	11.86**
	(4.336)	(4.084)	(5.158)
Observations	95	95	95
R-squared	0.596	0.209	0.683

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

three hypotheses on the role of initial natural abundance and NFA, and the allocative efficiency.[20]

[20] It should be noted that the sample decreases due to the list-wise deletion of the following economies: Burundi, Belize, Comoros, Cambodia, Lao PDR, Maldives, Mauritania, Mauritius, Nepal, Rwanda, Solomon Islands,

In summary, results are in accordance with the main hypothesis of this study that there is evidence on the negative association between subsoil natural resources and capital inflows, except for specification 2 with the measure of ΔNFL. Figure 1.9 displays the partial regression plot of the negative association between initial subsoil abundance and the subsequent average of net capital inflows. Thus, I have already established a significantly negative relationship between the initial abundance of subsoil natural resources and the subsequent annualized average of the ratio of net capital inflows to GDP. This suggests that subsoil resource-rich countries mostly affected the capital flow movements over the period 1996-2015.

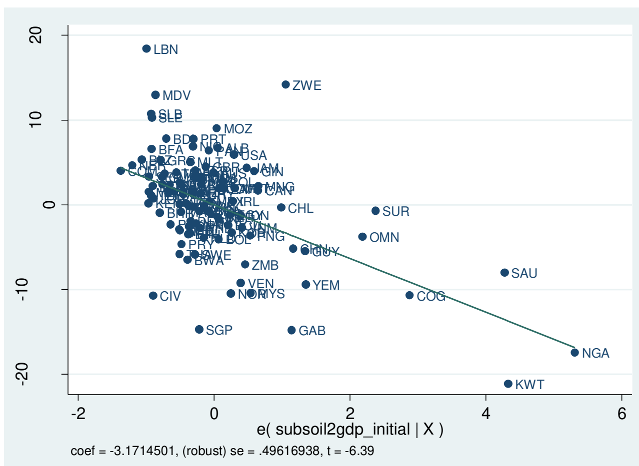

Figure 1.9: A partial regression plot between the initial abundance of subsoil resources and subsequent annualized average net capital inflows

1.6.2 Robustness Check Results

In this section, I run a battery of robustness checks regarding the following concerns. Starting off with the concern about the 2008-09 GFC might have a structural change in the relationship. Then, I drop OECD countries to keep the focus only on EMDEs as in the allocation puzzle of Gourinchas and Jeanne (2013). Next, besides the exclusion of OECD countries, I also exclude China and India due to their own characteristics. Then I employ a formal statistical test

Swaziland, and Zimbabwe. This specification also has a sever multicollinearity problem as the maximum value of the condition indices is about 32, exceeding the role of thumps of 30 as discussed by Gujarati and Porter (2009, pp. 337-342).

known as the DFBETA method to identify for potential, influential observations, and informally by dropping countries with population less than 1 million. I also run robust and quantile regressions, and the OLS with fixed effect regressions. Finally, I substitute the average years of schooling for the human capital wealth. In short, this section shows whether the main results are robust to such concerns.

First, Table 1.7 shows the estimates with a structural change test for the coefficient on real growth, using a dummy variable technique. Particularly, I consider constant and slope

Table 1.7: Testing for a Structural Break due to the 2008-09 GFC

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.292	-0.111	0.403
	(0.371)	(0.449)	(0.472)
Net Foreign Assets Abundance, 1995	-2.887***	1.033	-4.604***
	(0.860)	(0.840)	(1.299)
Human Capital Abundance, 1995	-0.426*	-0.335**	-0.407
	(0.237)	(0.138)	(0.293)
Subsoil Resource Abundance, 1995	-3.163***	-0.999	-4.046***
	(0.475)	(0.705)	(0.666)
Non-subsoil Resource Abundance, 1995	0.257***	0.0902	0.770***
	(0.0891)	(0.115)	(0.135)
KA Openness Chinn-Ito Index, 1995	-4.363**	0.0407	-4.684**
	(1.927)	(1.304)	(2.280)
Population growth (%), avg. 1996-2015	0.0821	-0.203	0.561*
	(0.177)	(0.178)	(0.301)
After the 2008-09 Global Financial Crisis (=1)	0.248	-0.0176	0.350
	(0.584)	(0.418)	(0.719)
Real per capita growth (%), avg.1996-2007	-0.437	0.139	-0.567
	(0.470)	(0.233)	(0.660)
Growth*GFC (%), avg.2010-2014	-0.107	0.00759	-0.151
	(0.251)	(0.180)	(0.308)
Constant	7.187**	3.039	6.577
	(3.029)	(2.198)	(4.104)
Observations	216	216	216
R-squared	0.515	0.141	0.616

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

differential effects regarding the neoclassical efficient allocation hypothesis. Estimates suggest no evidence of a structural change in the relationship between real per capita growth and net capital inflows.

Table 1.8 reports estimates after excluding OECD countries. Estimates remained qualitatively unchanged. In addition to the exclusion of OECD countries, Table 1.9 also drops China and India from the sample due to their own characteristics. Estimates in both tables remain qualitatively unchanged.

Table 1.8: The restricted sample that excludes OECD countries

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.344	-0.155	0.477
	(0.433)	(0.481)	(0.549)
Net Foreign Assets Abundance, 1995	-2.836***	1.126	-4.599***
	(0.912)	(0.882)	(1.377)
Human Capital Abundance, 1995	-0.510	-0.443***	-0.483
	(0.313)	(0.164)	(0.384)
Subsoil Resource Abundance, 1995	-3.247***	-0.969	-4.149***
	(0.509)	(0.710)	(0.717)
Non-subsoil Resource Abundance, 1995	0.279***	0.125	0.791***
	(0.0937)	(0.121)	(0.149)
KA Openness Chinn-Ito Index, 1995	-4.333	-0.830	-4.548
	(3.097)	(1.750)	(3.638)
Real per capita growth (%), avg. 1996-2015	-0.503	0.0668	-0.662
	(0.445)	(0.230)	(0.646)
Population growth (%), avg. 1996-2015	0.0454	-0.189	0.529
	(0.191)	(0.173)	(0.345)
Constant	7.769**	4.160*	7.021*
	(3.141)	(2.144)	(4.183)
Observations	85	85	85
R-squared	0.521	0.176	0.589

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1.9: Restricted sample that also excludes China and India

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.350	-0.157	0.489
	(0.436)	(0.483)	(0.554)
Net Foreign Assets Abundance, 1995	-2.829***	1.124	-4.584***
	(0.907)	(0.886)	(1.364)
Human Capital Abundance, 1995	-0.498	-0.456**	-0.467
	(0.334)	(0.178)	(0.412)
Subsoil Resource Abundance, 1995	-3.229***	-0.983	-4.119***
	(0.523)	(0.719)	(0.752)
Non-subsoil Resource Abundance, 1995	0.266**	0.133	0.765***
	(0.107)	(0.130)	(0.171)
KA Openness Chinn-Ito Index, 1995	-4.542	-0.736	-4.984
	(3.198)	(1.869)	(3.821)
Real per capita growth (%), avg. 1996-2015	-0.446	0.0317	-0.554
	(0.533)	(0.299)	(0.794)
Population growth (%), avg. 1996-2015	0.0596	-0.196	0.558
	(0.202)	(0.177)	(0.360)
Constant	7.679**	4.274*	6.927
	(3.335)	(2.244)	(4.492)
Observations	83	83	83
R-squared	0.515	0.176	0.584

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Next, I employ informal and formal statistical tests to identify influential observations. First, I start with excluding very small countries with a population of less than 1 million over any period of the time of the study. Second, after I employ two statistical methods that identify potential influential observations, and these are the DFBETA method and robust regression analysis. The list of these countries identified by DFBETA values is reported in Appendix Table A11. I drop these countries and run an OLS regression. By contrast, the robust regression reweights observations of the OLS regression which have values of Cook's distance greater than 1.

Tables 1.10,11 and 12 show the estimates of the informal and formal statistical tests, respectively. The estimates remain qualitatively unchanged, except for the coefficient on per capita real growth rates as shown in column 1 of Table 1.11. the real per capita growth rates variable becomes negative and significant, supporting the upstream capital flows or the allocation puzzle as in Gourinchas and Jeanne (2013).

Table 1.10: Restricted sample that also excludes small-sized economies
(Excluding countries with population less than 1 million)

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.498	-0.217	0.809
	(0.512)	(0.537)	(0.648)
Net Foreign Assets Abundance, 1995	-3.146***	0.788	-4.823***
	(1.080)	(1.085)	(1.608)
Human Capital Abundance, 1995	-0.329	-0.419**	-0.291
	(0.355)	(0.188)	(0.446)
Subsoil Resource Abundance, 1995	-3.181***	-1.005	-4.044***
	(0.548)	(0.685)	(0.812)
Non-subsoil Resource Abundance, 1995	0.240**	0.131	0.709***
	(0.115)	(0.156)	(0.181)
KA Openness Chinn-Ito Index, 1995	-3.888	-0.683	-4.129
	(3.287)	(1.930)	(4.050)
Real per capita growth (%), avg. 1996-2015	-0.364	-0.0122	-0.310
	(0.555)	(0.315)	(0.776)
Population growth (%), avg. 1996-2015	0.134	-0.299	0.767*
	(0.233)	(0.257)	(0.410)
Constant	4.723	4.340*	2.589
	(3.536)	(2.329)	(4.495)
Observations	74	74	74
R-squared	0.534	0.170	0.622

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1.11: Restricted sample that excludes influential observation
(Identified by DFBETA method)

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.528	-0.129	0.742
	(0.326)	(0.231)	(0.451)
Net Foreign Assets Abundance, 1995	-1.985***	0.424	-4.367***
	(0.711)	(0.511)	(1.042)
Human Capital Abundance, 1995	-0.314**	-0.263***	-0.246
	(0.152)	(0.0986)	(0.197)
Subsoil Resource Abundance, 1995	-2.678***	-0.549*	-3.591***
	(0.399)	(0.318)	(0.852)
Non-subsoil Resource Abundance, 1995	0.247**	0.0119	0.839***
	(0.0944)	(0.0785)	(0.151)
KA Openness Chinn-Ito Index, 1995	-4.414***	0.0942	-2.863*
	(1.248)	(0.919)	(1.695)
Real per capita growth (%), avg. 1996-2015	-0.597**	0.192	-0.438
	(0.234)	(0.157)	(0.319)
Population growth (%), avg. 1996-2015	0.210	-0.0215	0.597**
	(0.164)	(0.123)	(0.232)
Constant	5.501***	1.877	1.472
	(2.064)	(1.352)	(2.759)
Observations	80	88	83
R-squared	0.636	0.139	0.762

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1.12: Robust Regression Estimates

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.469	0.113	0.720*
	(0.312)	(0.165)	(0.383)
Net Foreign Assets Abundance, 1995	-2.951***	1.377***	-4.119***
	(0.740)	(0.405)	(0.910)
Human Capital Abundance, 1995	-0.478**	-0.215**	-0.594**
	(0.186)	(0.0988)	(0.228)
Subsoil Resource Abundance, 1995	-3.238***	-0.155	-3.919***
	(0.442)	(0.259)	(0.544)
Non-subsoil Resource Abundance, 1995	0.271**	-0.0318	0.811***
	(0.134)	(0.0711)	(0.165)
KA Openness Chinn-Ito Index, 1995	-3.007	-0.990	-1.957
	(1.879)	(0.997)	(2.311)
Real per capita growth (%), avg. 1996-2015	-0.168	0.110	-0.252
	(0.309)	(0.164)	(0.380)
Population growth (%), avg. 1996-2015	0.144	0.0357	0.353
	(0.205)	(0.110)	(0.252)
Constant	5.293**	1.882	4.403
	(2.463)	(1.308)	(3.028)
Observations	108	107	108
R-squared	0.555	0.181	0.668

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Interestingly, from the quantile regression estimates, results show that the coefficient on initial abundance on NFA, highlighted in Table 1.13, turns to be now strongly significant, while other estimates remain qualitatively unchanged.

Table 1.13: Quantile Regression Estimates

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.412	0.0655	0.711*
	(0.360)	(0.199)	(0.420)
Net Foreign Assets Abundance, 1995	-2.344***	1.677***	-3.970***
	(0.855)	(0.472)	(0.997)
Human Capital Abundance, 1995	-0.492**	-0.241**	-0.402
	(0.214)	(0.118)	(0.250)
Subsoil Resource Abundance, 1995	-3.137***	-0.135	-4.529***
	(0.510)	(0.282)	(0.596)
Non-subsoil Resource Abundance, 1995	0.330**	0.0538	0.944***
	(0.155)	(0.0854)	(0.181)
KA Openness Chinn-Ito Index, 1995	-2.876	-1.445	-2.586
	(2.170)	(1.197)	(2.532)
Real per capita growth (%), avg. 1996-2015	-0.521	-0.0841	-0.542
	(0.357)	(0.197)	(0.417)
Population growth (%), avg. 1996-2015	0.0952	-0.0655	0.397
	(0.237)	(0.131)	(0.276)
Constant	6.330**	2.944*	3.224
	(2.844)	(1.569)	(3.318)
Observations	108	108	108

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In addition, the use of cross-section regression raises a concern about the bias from unobserved heterogeneity. To mitigate that, I could use country-group fixed effects.[21] Both Tables 1.14-1 and 1.14-2 report the regression estimates of the models with *income*-group and *region*-group fixed effects, respectively. Estimates in both tables show the importance of fixed effects to mitigate the bias stemming from unobserved omitted variables. Nevertheless, results remain qualitatively unaffected, particularly with regard to the initial abundance measures of NFA and subsoil natural resources.

[21] The use of fixed effects of country groups, rather than countries, helps us not to lose large degrees of freedom.

Table 1.14-1: Estimates of the model with income-group fixed effects

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.565	-0.168	0.897*
	(0.367)	(0.435)	(0.500)
Net Foreign Assets Abundance, 1995	-2.669***	1.008	-4.233***
	(0.929)	(0.859)	(1.371)
Human Capital Abundance, 1995	-0.429*	-0.369***	-0.452*
	(0.220)	(0.126)	(0.265)
Subsoil Resource Abundance, 1995	-2.440***	-0.722	-3.027***
	(0.583)	(0.698)	(0.705)
Non-subsoil Resource Abundance, 1995	-0.0106	0.0942	0.292
	(0.138)	(0.141)	(0.206)
KA Openness Chinn-Ito Index, 1995	-3.271	-0.506	-3.114
	(2.260)	(1.319)	(2.583)
Real per capita growth (%), avg. 1996-2015	-0.268	0.150	-0.224
	(0.367)	(0.237)	(0.550)
Population growth (%), avg. 1996-2015	0.0559	-0.00729	0.357
	(0.164)	(0.166)	(0.255)
HI_OECD	4.870	4.786*	3.118
	(3.180)	(2.467)	(4.099)
HI_NonOECD	1.398	-0.0830	0.681
	(3.701)	(2.402)	(4.299)
UMI	6.464**	4.192*	4.552
	(2.632)	(2.113)	(3.486)
LMI	5.584**	2.378	5.141
	(2.521)	(1.924)	(3.895)
LI	10.84***	2.494	14.48***
	(2.913)	(2.241)	(3.618)
Observations	108	108	108
R-squared	0.625	0.257	0.759

Robust standard errors in parentheses

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

Table 1.14-2: Estimates of the model with region-group fixed effects

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.260	-0.144	0.325
	(0.431)	(0.476)	(0.535)
Net Foreign Assets Abundance, 1995	-2.730***	0.908	-4.464***
	(0.904)	(0.894)	(1.364)
Human Capital Abundance, 1995	-0.523*	-0.346*	-0.564
	(0.289)	(0.179)	(0.360)
Subsoil Resource Abundance, 1995	-3.281***	-0.998	-4.180***
	(0.556)	(0.730)	(0.764)
Non-subsoil Resource Abundance, 1995	0.283***	0.135	0.756***
	(0.102)	(0.131)	(0.147)
KA Openness Chinn-Ito Index, 1995	-4.155*	-1.379	-4.130
	(2.429)	(1.442)	(3.146)
Real per capita growth (%), avg. 1996-2015	-0.264	0.124	-0.394
	(0.455)	(0.281)	(0.720)
Population growth (%), avg. 1996-2015	0.0255	-0.0391	0.430
	(0.209)	(0.176)	(0.355)
East Asia & Pacific	5.712	3.395	6.556
	(3.610)	(2.608)	(5.958)
Europe & Central Asia	7.077**	4.976**	6.938
	(3.165)	(2.421)	(4.567)
Latin America & Caribbean	8.232***	3.888	7.295*
	(2.921)	(2.387)	(3.972)
Middle East & North Africa	8.387**	3.414	8.488*
	(3.277)	(2.445)	(4.282)
North America	13.62***	6.891*	13.48**
	(4.282)	(3.589)	(5.947)
South Asia	6.656*	2.564	5.705
	(3.835)	(2.259)	(5.168)
Sub-Saharan Africa	8.192**	1.944	9.411**
	(3.351)	(2.581)	(4.501)
Observations	108	108	108
R-squared	0.594	0.217	0.717

Robust standard errors in parentheses

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

Finally, due to the concerns over the measure of human capital stock, I replace this stock measure by the widely-used proxy variable that captures the average years of schooling as in Barro and Lee (2013). The results are qualitatively similar.

Table 1.15-1: (Replicating Table 1.5 but with years of schooling as a proxy for human capital)

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.329	-0.116	0.662
	(0.493)	(0.528)	(0.605)
Net Foreign Assets Abundance, 1995	-3.243***	0.735	-4.653***
	(0.846)	(0.955)	(1.218)
Years of Schooling, 1995	-0.162	0.0940	-0.673*
	(0.301)	(0.199)	(0.380)
Subsoil Resource Abundance, 1995	-3.100***	-1.358	-3.468***
	(0.678)	(0.984)	(0.791)
Non-subsoil Resource Abundance, 1995	0.202	0.0182	0.671***
	(0.135)	(0.168)	(0.184)
KA Openness Chinn-Ito Index, 1995	-4.638*	-1.270	-2.847
	(2.415)	(1.433)	(2.895)
Real per capita growth (%), avg. 1996-2015	-0.179	0.119	-0.0250
	(0.468)	(0.290)	(0.617)
Population growth (%), avg. 1996-2015	0.113	-0.0319	0.349
	(0.167)	(0.159)	(0.261)
Constant	3.606	0.262	4.407
	(2.688)	(2.540)	(3.303)
Observations	98	98	98
R-squared	0.534	0.139	0.655

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1.15-2: (Replicating Table 1.6 but with years of schooling as a proxy for human capital)

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.742	0.107	1.067*
	(0.491)	(0.647)	(0.588)
Net Foreign Assets Abundance, 1995	-2.852***	1.158	-4.384***
	(0.834)	(0.999)	(1.239)
Years of Schooling, 1995	-0.0881	-0.0697	-0.572
	(0.348)	(0.219)	(0.477)
Subsoil Resource Abundance, 1995	-3.273***	-1.457	-3.592***
	(0.529)	(0.974)	(0.664)
Non-subsoil Resource Abundance, 1995	0.160	-0.0492	0.589***
	(0.130)	(0.200)	(0.178)
KA Openness Chinn-Ito Index, 1995	-1.381	-0.131	1.047
	(1.862)	(1.371)	(2.546)
Real per capita growth (%), avg. 1996-2015	0.118	0.337	0.376
	(0.439)	(0.354)	(0.619)
Population growth (%), avg. 1996-2015	-0.126	-0.181	0.0834
	(0.218)	(0.212)	(0.346)
Institutional Quality ICRG Index, 1996	-7.726	-1.317	-6.343
	(5.561)	(5.006)	(7.244)
Financial Development Index, 1995	-1.245	-0.614	-2.353
	(4.092)	(2.606)	(5.241)
Constant	5.063	1.331	4.624
	(3.285)	(4.137)	(4.081)
Observations	87	87	87
R-squared	0.615	0.199	0.689

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

All in all, this section shows that the main results obtained in the previous section remain overall qualitatively unchanged; specifically, with regard to the coefficients on the initial abundance measures of the subsoil natural resources and NFA.

1.7 Discussion and Conclusion

Although the neoclassical growth theory suggests that low-income countries should associate with faster growth rates and net capital *inflows*, the empirical literature shows evidence on Lucas' paradox and/or the allocation puzzle. That is, fast-growing EMDEs associate with net capital *outflows* on average. In this study, I revisit studying the upstream capital flows in the era of financial globalization during 1995-2015 while emphasizing the role of natural resource abundance. I take advantage of a recently released data on wealth accounts by the World Bank, supplemented by data on other relevant variables. Wealth is defined as the sum of produced capital, human capital, natural capital, NFA (Lange, Wodon, and Carey 2018), plus social capital and domestic financial capital (Gylfason 2004). Moreover, I use three alternative measures of net total capital inflows, the typical one of which is the negative CA while the others incorporate official aid flows and valuation effects, respectfully. Interestingly, the typical and aid-adjusted CA measures produce similar estimates and, more importantly, with regard to natural capital. By using these two measures, I find statistical evidence on the negative association between the initial abundance of *subsoil* natural capital and net capital inflows. Besides, I find supporting evidence on the persistence of global imbalances, captured by the negative coefficient on the initial NFA abundance. On the contrary, there is no supporting evidence on the allocative efficiency hypothesis— the association between productivity growth and net capital inflows. This could stem from the large sample size rather than the productivity growth measure. Previous studies such as Chinn and Prasad (2003) and Alfaro et al. (2014) find that as the sample size increases, the relationship becomes either insignificant or weakly and positively significant. Alfaro et al. also show that replacing the average real per capita growth with the catch-up productivity measure of Gourinchas and Jeanne (2013) does not explain the relationship differences.

Interestingly, the measure that incorporates valuation effects (ΔNFL) alter the previous main results, implying great importance for the role of valuation effects by reversing the sign on initial NFA abundance although being statistically insignificant. In this regard, Gourinchas and Rey (2005) demonstrate that the US has enjoyed an exorbitant privilege in which the total return on its foreign assets exceeds its foreign liabilities, despite being a debtor country, especially in the post-Bretton Woods period till 2004. They conclude that valuation adjustment has played a stabilization role for the US. In a later study, Gourinchas and Rey (2015) also demonstrate that valuation effects have played an important role in the current international financial system in which G7 countries were the largest winners while the BRICS countries were losers.

This study, therefore, shows that the introduction of natural capital allows for the role of economic policy, unlike the standard neoclassical model. Policymakers in EMDEs can decide on how to utilize the stocks of natural resources, so they impact the GDP level and growth (through liquidation rather than productive investment). With capital mobility, as in the financial globalization era we live in, policymakers have the potential to mitigate the Dutch disease effects through ameliorating the appreciation pressure in the exchange rate. If the accumulation of NFA is implemented as suggested by PIH, smoothing not only consumption but also investments in physical and human capital, then K_N could also crowd in K_F in the development process. In sum, the extended open-economy framework suggests that the PIH about smoothing both consumption and investment in human capital and physical capital.

Particularly, this study shows statistical evidence that the accumulation in the form of NFA positions by subsoil-rich economies explains a large part of the upstream capital flows phenomenon. The assumption of *imperfect* capital mobility is critical to the seminal models of uneven development (Krugman 1981), and the natural resource-curse (Rodriguez and Sachs 1999). Resource-rich countries can benefit from capital mobility to break the unsustainable overconsumption argument by Rodriguez and Sachs (1999). Rodriguez and Sachs, acknowledge the role of international capital markets in breaking out the unsustainable overconsumption. They state:

> If an economy can invest its resource windfalls in international assets that pay permanent annuities, then the problem we are alluding to could not occur. Any economy experiencing a resource boom will invest it and permanently consume the interest it earns on that asset (p. 278).

Moreover, while Gourinchas and Jeanne (2013) attribute the allocation puzzle to the capacity constraint on investment, rather than saving, I argue that the underlying cause could be about the abundance of natural capital in EMDEs through the Dutch disease effects.[22] That is, the Dutch disease effects cause not only an appreciation of the exchange rates, but also an expansion of the resource sector that crowds out investment opportunities on the modern sector which has a larger capacity for new investment. Besides, EMDEs could use international capital markets to maintain their real exchange rates manageable, through the accumulation of foreign reserves, in order to protect their exports' competitiveness and mitigate the Dutch disease effects. This could also be somehow linked to the argument of "fear of floating" by Calvo and Reinhart (2002). Foreign reserve accumulation allows such subsoil countries to stabilize their exchange rates.

An important implication of the findings suggests the greater role of economic policy in explaining the patterns of capital flows, unlike in the standard neoclassical growth theory adopted by the previous literature of capital flows. Results suggest that the upstream flows could be driven by foreign asset accumulation by *subsoil*-type endowed countries. On the other hand, Table 1.4 shows that the high-income, non-OECD countries associate with the highest subsoil abundance and slowest growth relatively over the last few decades. Therefore, while subsoil resource-rich countries should adopt a policy mix of reserve accumulation and industrial policy, data suggest the need for assigning more weight on the latter that could generate sustainable

[22] In this regard, Hausmann, Rodrik, and Velasco (2005) explain growth diagnostics, and emphasize that lower growth performance could be either from saving or investment binding constraints.

rapid growth. It should be highlighted that besides the challenges for industrialization, any policy framework should emphasize creating employment opportunities that keep pace with the growing population. Also, reserve accumulation allows for the use of exchange rates as a developmental policy tool as in the export-led growth strategy implemented by fast-growing emerging Asian countries. Shortly, studies demonstrate that an undervalued or appropriate level of the exchange rate could be a key support for real growth and for creating employment opportunities (see, e.g., Frenkel and Taylor 2006; Rodrik 2008)

It should be noted that this study does not control for some important aspects that could also affect capital flows. These include global real and financial factors (except for the structural break test of 2008-09 GFC), the dollar hegemony, and the financial deregulation and innovations in the advanced economies in the recent few decades.

Chapter 2

International Capital Movements and Global Imbalances: The Role of Complementarities and Tradeoffs in Capital Stocks

2.1 Introduction

Cross-border capital flows have important implications on the national level and the global economy. Stable flows of foreign capital could augment the domestic accumulation of physical capital and hence spur economic growth, while volatile flows increase the risks and trigger financial and economic crises. Therefore, the determinants of capital flows have been extensively investigated in the literature. The determinants could be broadly classified into two groups: push (or external) factors and pull (or internal) factors. While the former includes a set of variables that capture global economic and financial conditions, the latter focuses on country-specific conditions (see, e.g., Hannan 2017; Koepke 2015).

In a previous study, I concentrated on the pull factors, as in the context of an extended open-economy growth framework with a broad definition of wealth, so that the income level is a function of total wealth.[23] Following Gylfason (2004), total wealth (W) is defined as the sum of the following components: produced capital and urban land (K_P), net foreign asset position (K_F), natural capital (K_N), human capital (K_H), social capital, and domestic financial capital. While the first four components are available in stock units in the data, the last two are proxied by

[23] There is a minimum requirement of sustainable development based on a weak sustainability assumption (see Barbier 2007). Succinctly, proponents of the weak sustainability argue that natural capital and other types of capital could be somehow substitutes during the economic development process. Put simply, the minimum requirement of sustainable development is to maintain a non-decreasing per capita total wealth over time.

composite indexes for institutional quality (IQ) and financial system development (FD). Therefore, the extended model, in per capita level, is as follows:

$$y_i = f_i(w_i) \text{ , where } w = k_P + k_F + k_N + k_H + IQ + FD \quad (2.1)$$

Figure 2.1 illustrates the extended economic growth framework, while data show that natural capital and human capital account for the lion's share in wealth as defined by the World Bank. Refer to Table B1 in the appendix for a country-group comparison on the wealth composition as of 2014.[24]

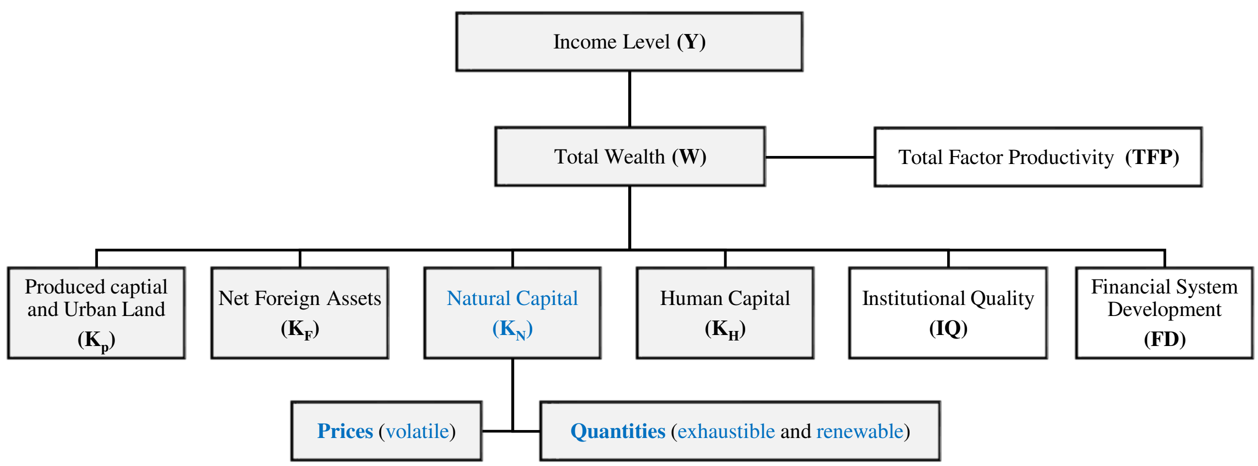

Figure 2.1: Sustainable development requires non-decreasing per capita total wealth over time

Specifically, I examined international capital movements through the role of cross-country differences in: 1) factor supply abundance measures, and 2) overall productivity growth. The study found no supporting evidence on the allocative efficiency of international capital flows. In other words, there was an *insignificant* relationship between annualized averages of net total capital flows and real per capita growth rates during 1996-2015.

[24] The Wealth Accounting database of the World Bank does not provide estimates for the last two components (domestic financial capital and social capital) as in the definition of wealth by Gylfason (2004). It should be noted that they acknowledge that social capital is of great importance but could not construct a stock measure due to the difficulty of estimating social trusts (Lange et al. 2018, p. 33).

The lack of evidence on the allocative efficiency of capital flows could be attributed to the focus of that study on *overall* productivity growth. However, I could infer from the wide literature that there could be *specific*, rather than *overall*, complementarity effects. First, the productivity level of a country is understood as the technology measure of how efficiently or effectively an economy combines all measures of factor supply in the production process, so our focus on per capita real growth mostly captures the *overall* complementarity. The *overall* complementarity is known as total factor productivity (TFP) or multi-factor productivity as in Acemoglu (2009, p. 78). However, cross-border capital flows could target specific types of capital stocks. There might thus be specific complementarities and tradeoffs between specific types of capital stocks. For instance, the paradox of "Why Doesn't Capital Flow from Rich to Poor Countries?" is attributed to human capital acting as a positive spillover effect (Lucas 1990). In this regard, Boz, Cubeddu, and Obstfeld (2017) interpret Lucas' argument as the complementarity effect between physical capital and human capital.

In addition, there are many other hypotheses motivated by synthesizing the literature of international financial and sustainable development. For example, Blecker (2005) provides an explanation that the persistent global imbalances reflect a comparative advantage in selling financial assets in advanced countries, while another explanation is about a global saving glut as in Bernanke (2005) and Chinn, Eichengreen, and Ito (2014). Moreover, superior institutions in developed economies are found to attract foreign flows (Alfaro, Kalemli-Ozcan, and Volosovych 2008; Papaioannou 2009). I also hypothesize the natural capital crowding-out effects on institutional quality (Gylfason 2004) and the development of financial systems (Gylfason 2004; Beck 2011). In short, all these specific complementarities and tradeoffs are motivated and tested for through the extended growth framework with the broad definition of total wealth.

By focusing on the specific complementariness and tradeoffs, I could test not only for pull factors but also for push factors. I could also provide a way of testing for a set of explanations for global imbalances and capital flows. In this study, therefore, I aim to answer the following main research questions:

i. Regarding capital flows, is there any evidence on specific complementarities and tradeoffs in capital stocks?
ii. If so, how does that help us better understand the current international monetary and financial system (IMFS)?

An overview of the main findings indicates the following:

- An amplification effect on the upstream capital flows;
- A stabilizing role of the valuation effects (VEs);
- A positive spillover effect from human capital only holds for middle-income, semi-industrialized economies;
- The importance of superior institutions in reducing the resource-seeking capital inflows;
- Empirical support for the comparative advantage in financial assets, and
- Inconclusive results for the global saving glut hypothesis.

Accordingly, some policy implications of the results are drawn and discussed in the conclusion section. Specifically, I shed light on different policies for different country groups whether they are resource-rich countries, export-led industrial emerging markets, and CA deficit advanced countries. All in all, the focus on specific complementarity and tradeoff effects allows us to synthesize the literature of international finance and sustainable development in order to better understand the current IMFS.

The remainder of this paper is organized as follows. The next section conceptualizes and motivates a set of hypotheses on specific complementarities and tradeoffs. Section 2.3 discusses data sources, summary statistics, and the empirical approach. Section 2.4 presents detailed diagnoses and the regression results. While section 2.5 provides a summary of the priori expectations and the corresponding findings, the last section concludes with a discussion on the main findings followed by some policy implications.

2.2 Specific Complementarities and Tradeoffs

Using the unified sustainable growth framework with the broad definition of wealth accumulation, I could test for a set of hypotheses motivated by synthesizing the literature of international finance and sustainable development. All these hypotheses could be thought of as *specific*, rather than *overall*, complementarity effects between some types of capital stocks. These hypotheses are inferred from explanations such as the argument of a positive externality generated from the interaction between human capital and physical capital, which in turn attracts foreign capital flows (Lucas 1990; Boz et al. 2017). Another argument is about the debate on money non-neutrality, and that the global imbalances could be explained by a comparative advantage in selling financial assets (Blecker 2005). In short, this section motivates a set of specific complementarity and tradeoff hypotheses by utilizing the sustainable growth framework that I have developed in a previous study.

Figure 2.2 illustrates how the initial abundances of two *specific* types of capital (i and j) could affect economic growth directly and indirectly. The indirect effect is generated by the interdependency of two capital types and, hence, acts as a specific complementarity/ tradeoff to economic growth and to cross-border capital flows. In other words, the interaction between two specific types of capital stocks could generate a *positive* spillover effect, as in Lucas' (1990) argument, or a *negative* spillover effect, as we will discuss in other explanations.

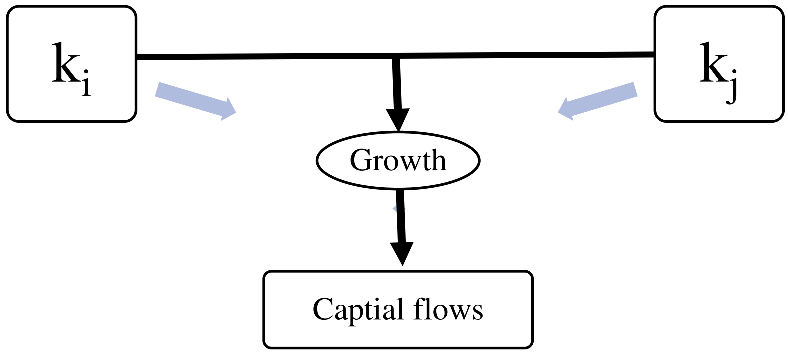

Figure 2.2: Specific complementarities or tradeoffs to economic growth and/or capital flows

Before proceeding further in hypothesizing our *specific* complementarity/ tradeoff effects, it is of importance to first recall the main findings of my previous study that captures the *overall* complementarity. First, there is no supporting evidence of the allocative efficiency hypothesis.[25] Second, I find strong statistical evidence that the net capital *outflows* seem to be driven by the initial abundance of *subsoil* natural capital, while non-subsoil abundance tends to associate with net capital inflows. The statistical significance of the latter, however, disappears with a few robustness checks. This puts an emphasis on our distinction between subsoil and non-subsoil types of natural capital. While subsoil assets refer to fossil fuel energy, minerals, and metals; non-subsoil assets refer to agricultural land, forests, and protected areas.[26] Third, there is statistical evidence on the persistence of global imbalances in current account balances and net foreign asset positions. However, incorporating the valuation effects into capital flows mute these impacts. In this regard, Gourinchas and Rey (2015) elaborate that there is an asymmetric

[25] Specifically, there is no evidence on the relationship between the annualized averages of real per-capita growth rates and net total capital flows as a share of GDP during 1996-2015.
[26] Lange, Wodon, and Carey (2018) refer to subsoil and non-subsoil as non-renewable and renewable resources, respectively. They emphasize that non-renewable resources provide a one-time chance to finance development by investing resource rents, while renewable resources could perpetuate development if managed sustainably (p.2).

structure of the NFA positions making G7 winners and BRICs losers in terms of the valuation effects. That is mainly due to the stylized fact that advanced economies are long (or net lenders) in risky assets whereas emerging markets are short (or net borrowers) in risky assets. Furthermore, in their 2019 external sector report, the International Monetary Fund emphasizes the role of valuation effects that generate discrepancies between the external imbalances in CA balances and the net international investment positions (pp. 9-10).

Consequently, the departure from an overall to specific complementarities and tradeoffs in capital stock wealth abundance measures provides us with a way of testing for up to 15 possible combinations.[27] Most of which could be backed up adequately by different hypotheses and arguments in the literature of international finance and sustainable development to explain international capital movements and global imbalances. Table 2.1 summarizes 13 motivated interaction combinations and their priori expectations on net total capital inflows.

Table 2.1: Possible complementarities/tradeoffs and priori expectations

	K_P	K_{NFA}	K_H	K_N	FD	IQ
K_P						
K_{NFA}	a. (-)					
K_H	b. (+)	NA				
K_N	c. (-)	d. (-/+)	e. (-)			
FD	f. (-)	g. (-)	h. (+)	i. (-)		
IQ	j. (+)	k. (-)	NA	l. (-)	m. (-)	

Note: - Highlighted interactions will be examined in separate subsections.
- Not applicable (NA) combinations refer to interactions with inadequate priori expectations.

[27] That is calculated as: $C(6,2) = \frac{6!}{2!*(6-2)!} = \frac{6!}{2!*4!} = 15$ possible interaction combinations.

The priori expectations, shown in Table 2.1, are hypothesized as follows:

a. Based on the standard neoclassical theory, rich countries should tend to have higher physical capital abundance and to be net external creditors, so they should associate with net capital *outflows* rather than inflows. The interdependency should exacerbate the outflows too.
b. Lucas (1990) demonstrates the paradox and concludes that human capital acts as a positive spillover, which leads to higher capital inflows. Particularly, the positive spillover effect is generated by the interdependency between physical capital and human capital.
c. According to the resource curse literature that higher resource-abundant countries could have higher investment rates but slower growth performance. This could be due to the diminishing return assumption as in the neoclassical theory or due to other reasons. Nili and Rastad (2007), for example, find that oil-exporting economies had relatively higher investment rates but slower growth performance, and attribute that to frictions in their financial systems that fail to allocate funds to more productive entrepreneurial, rather than rent-seeking, activities. Thus, given physical capital abundance, I expect an accelerating effect from natural capital on net capital *outflows*, as captured by a negative coefficient.
d. As concluded in my previous study, subsoil (non-subsoil) abundant countries tend to be net external creditors (debtors). Hence, I expect an amplifying negative (positive) effect on net capital inflows from the higher abundance of subsoil (non-subsoil) natural capital, given initial external positions.
e. Gylfason (2004) argues that it is all about natural capital that directly and indirectly affects economic growth. Specifically, he explains the indirect effect through crowding *out* all other types of capital stocks including human capital. Thus, I could expect an interdependency

between natural capital and human capital that generates a negative spillover and, hence, less foreign capital flows in.[28]

f. Given a high physical capital abundance, the higher financial system development could ensure that funds are efficiently allocated to most productive activities and, hence, reduce the need for foreign capital inflows.

g. Blecker (2005) explains the persistent global imbalances by arguing for a comparative advantage in selling financial assets. Deficit CA or net capital importing countries were able to sustain such positions through their relatively higher degrees of financial system development. Simply put, given an initial debtor position (NFA$<$0), the higher degrees of financial development should associate with larger net capital inflows, as captured by a negative interaction term.

h. Although the interdependence between human capital and financial development is less clear, both of which have been identified as absorptive capacities in which the growth impact from FDI could materialize in a hosting economy. Borensztein, De Gregorio, and Lee (1998) find a threshold of human capital while Alfaro et al. (2004) find a threshold of financial development. Therefore, to some extent, I hypothesize that both absorptive capacities should generate a complementarity to growth and capital inflows.

i. This is similar to the hypothesis (e) on the crowding-out argument by Gylfason (2004). Also, Beck (2011) discusses a resource curse on financial development. I could hypothesize that as follows: Natural capital distorts domestic financial development, and such a negative spillover adversely affects growth rates and capital inflows. Regarding our distinction of natural capital types, therefore, I expect a negative (positive) direct effect from subsoil (non-

[28] It should be noted that Botswana is an exceptional case in which rents were channeled efficiently to accumulate human capital that resulted in one of the highest growing economies.

subsoil) natural capital, and a positive direct effect from financial development. Given a high abundance level of *subsoil* abundance, we expect a dampening effect from the higher financial system development on net capital *outflows*.

j. Acemoglu, Johnson, and Robinson (2001) examine the fundamental causes of growth and find evidence on the role of institutions; whereas, Alfaro et al. (2008) and Papaioannou (2009) conclude that the leading factor behind the Lucas' (1990) paradox is intuitional quality.[29] This could also imply that there is a positive growth spillover effect, generated from physical capital abundance and better institutions, which attracts more capital inflows. Thus, I could hypothesize that rich economies, in terms of physical abundance, were able to associate with net capital outflows due to their superior institutions.

k. This hypothesis is closely related to the previous. One the one hand, the standard neoclassical theory seemed to be irrelevant because it suggests that rich countries should be creditors rather than debtors. On the other, the empirical observation implies that debtor countries were able to sustain CA deficit or capital inflows because of their superior institutions. Following the empirical observation, therefore, I expect a negative main effect from initial NFA and positive for institutional quality, while the indirect effect should be negative. That is, given an external debt position (NFA<0), the higher institutional quality, the more capital should flow in.

l. Gylfason (2004) asserts that it is all about natural capital that adversely affects economic growth directly and indirectly through crowding out other types of capital stocks, including social capital (or institutions). While Mehlum, Moene, and Torvik (2006) demonstrate that resource-dependent countries with only very superior institutions could neutralize the

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[29] While the focus of Alfaro et al. (2008) is on *gross private* capital inflows using a cross-section OLS and IV analyses, Papaioannou (2009) adopts a gravity equation analyses using cross-section and panel analyses.

resource curse. Hence, given a subsoil (non-subsoil) capital abundance with a negative (positive) main direct effect on capital inflows, I expect an accelerating (dampening) effect from the institutional quality on net capital inflows.[30]

m. Chinn et al. (2014) test the global saving glut argument, introduced by Bernanke (2005), via interacting not only FD and IQ but also KA openness. Their priori expectation is that lower values of these variables explain the upstream capital flows from emerging markets and developing economies (EMDEs) to advanced economies (AEs).

2.3 Data and Empirical Approach

2.3.1 Data Sources

I rely on different datasets that collectively cover a sample of 95 countries during 1995-2015. First, data sources for net total capital inflows include the International Monetary Fund (IMF)- International Financial Statistics (IFS), Lane and Milesi-Ferretti (2007, 2017) and Alfaro et al. (2014). There are two main measures of net total capital inflows. The typical measure in the literature is the reversed sign of the current account balance, and the other adjusts for valuations of a country's gross assets and liabilities. The relationship between the two measures is captured by the fact that the net foreign asset (NFA) position is the sum of cumulative CA surpluses over the past till present and the valuation effects at the current year, and by applying stock-flow accounting we get the second measure of net total capital inflows. In short, the typical measure is (-CA, %GDP) and the valuation-adjusted measure is (-ΔNFA or ΔNFL, %GDP). Data of the former is available in the IMF-IFS, and the latter is available and constructed by Lane and Milesi-Ferretti.

[30] As discussed earlier, unlike non-subsoil types, subsoil resources provide a one-time chance to finance development (Lange, Wodon, and Carey 2018, p. 33).

Other data sources are as follows. Wealth stock measures are available in the World Bank (WB)- Wealth Accounts database (WA). A proxy for the institutional quality index is constructed as a composite index using the six sub-indicators available in the International Country Risk Guide (ICRG).[31] These sub-indicators are: 1) Voice and Accountability, 2) Political Stability and Absence of Violence, 3) Government Effectiveness, 4) Regulatory Quality, 5) Rule of Law, and 6) Control of Corruption. In addition, I adopt a composite index for financial system development constructed by Svirydzenka (2016), and the data of which are available by the IMF. This measure is constructed using a bottom-up approach in three levels. The composite index of financial system development is constructed from two sub-indicators: financial institutions and financial markets. Each of these is also constructed from three sub-indicators regarding depth, access, and efficiency that rely on many financial variables. Finally, I use a *de jure* capital account openness index constructed by Chinn and Ito (2006).

2.3.2 Econometric Approach

I employ an OLS regression analysis with robust standard errors while modifying a specification by Gourinchas and Jeanne (2013). The analysis covers a sample of 95 countries and spans over 1995-2015. To mitigate endogeneity concerns due to simultaneity bias, I will run the annualized averages of net capital inflows over 1996-2015 on the lagged initial abundance measures of capital stocks in 1995. Simply put, I examine the role of initial abundance measures on the subsequent annualized averages net capital inflows, expressed as %GDP to eliminate the effects of country-size differences.

To capture the specific complementarities and trade-offs, an interaction effect is included. I aim is to capture the interdependency of two or more of the wealth abundance components that

[31] The composite index is constructed by assigning equal weights to the six indictors, so that it ranges between zero and one.

affect economic growth and, more importantly, act as a complementarity or tradeoff to international capital flows. Therefore, I could estimate the following cross-country specification:

$$\left(\frac{F}{Y}\right)_{avg,\,i} = \alpha_0 + a_1\left(k_i \cdot k_j\right)_{1995,i} + a_2(g_n)_{avg,\,i} + (W_{1995,i})'\beta + (Z_{1995,i})'\gamma + \varepsilon_i$$

$$Where\ k_i, k_j \in W \cup Z;\ W = \{\frac{k_P}{y}, \frac{k_F}{y}, \frac{k_H}{y}, \frac{k_N}{y}\};\ and\ Z=\{\ FD,\ IQ,\ KA\ \} \qquad (2.2)$$

The dependent variable is the subsequent annualized averages of net total capital inflows, expressed as %GDP, during 1996-2015. On the right-hand side, the vectors W and Z capture the total wealth components. One the one hand, the vector W captures the initial *abundance wealth measures* ($\frac{k_P}{y}, \frac{k_F}{y}, \frac{k_H}{y}$, and $\frac{k_N}{y}$), where the numerators and denominators are in per capita units and based on constant prices in 2014 USD at market exchange rates. On the other, the vector Z refers to the *wealth index proxies*, rather than stock units, due to unavailability of data. These are composite indexes for financial system development (FD) and for institutional quality (IQ), plus a de jure index for capital account openness (KAO) to allow for financial globalization. In additions, the variable g_n refers to the annualized average of the population growth rates during 1996-2015. This is because the numerator and denominator of the dependent variable are not adjusted in per capita units, and the growth in population implies a decreasing capital-labor ratio.

Although I will keep checking whether the main terms change or not, more attention will be on the interaction term coefficient a_1 that captures the complementarity and tradeoff hypotheses. While the inclusion of an interaction term could lead to a potential multicollinearity, Balli and Sorensen (2013) mention that collinearity from interaction terms should not be a problem (p. 587, footnote #4).

2.3.3 Descriptive Statistics

Table 2.2 presents summary statistics of the variables, whereas the correlation matrix is reported in Appendix Table B2. Overall, there are wide variations in the data, and there are some variables of greater interest. First, the typical and valuation adjusted measures of net total capital inflows (-CA, ΔNFL) have mean values in opposite signs. This reflects a stabilizing role of the valuation effects in the current international monetary and financial system. Second, the decomposition of natural capital is critical, as discussed in previous studies on the natural resource curse (see e.g., Barbier 2007, p. 118). Also, *subsoil* or non-renewable resources provide a one-time chance to finance development by investing resource rents, while renewable resources could perpetuate development if managed sustainably (Lange et al. 2018, p.2). Statistics show that countries differ widely in their abundance levels of the decomposed natural capital. Finally, it could be observed that the countries in our sample were on average net external debtors in the initial year of 1995.

Table 2.2: Summary Statistics

Variable	N	Mean	SD	Min	Max
-CA (%GDP), avg. 1996-2015	95	1.98	7.21	-28.48	18.88
ΔNFL (%GDP), LM, avg. 1996-2015	95	-0.87	4.14	-21.73	10.95
Population growth (%), avg. 1996-2015	95	2.16	2.55	-1.13	15.7
Produced Capital Abundance, 1995	95	3.86	1.63	1.72	13.67
Net Foreign Assets Abundance, 1995	95	-0.52	0.8	-3.42	1.78
Human Capital Abundance, 1995	95	8.17	2.67	1.16	16.6
Natural Capital Abundance, 1995	95	5.02	5.34	0	22.92
Subsoil Resource Abundance, 1995	95	0.57	1.19	0	6.13
Non-subsoil Resource Abundance, 1995	95	4.45	5.04	0	21.94
KA Openness Chinn-Ito Index, 1995	95	0.54	0.32	0	1
Financial Development Index, 1995	95	0.35	0.25	0.05	0.87
Institutional Quality ICRG Index, 1996	95	0.64	0.15	0.32	0.93

2.4 Diagnoses and Empirical Results

Most of the hypotheses could be tested for via interaction terms, but some hypotheses need some diagnostics and specific treatments when tested. I devote separate subsections for such hypotheses along with some important ones, while the others will be together discussed afterward due to space limitations.

2.4.1 Human Capital Externality

Previous studies argue that advanced economies tend to attract capital flows because of their human capital acting as a positive externality as in Lucas (1990). In this regard, Boz et al. (2017) interpret that as a complementarity effect between physical capital and human capital. Thus, I could capture the nonlinear relationship between capital flows and these two types of capital stocks by a *continuous* interaction term specification.

First, I should note that the human capital abundance has entered with a puzzling negative coefficient when not considering an interaction term, and I have raised concerns in a previous study about the calculation method on whether it captures the quality or the cost of the labor force. The World Bank's measure of human capital wealth is based on the Jorgenson-Fraumeni lifetime earnings approach (1992). Hamilton et al. (2018) state, "Human capital wealth is defined as the discounted value of future earnings for a country's labor force" (p. 117). Specifically, their approach is based on 1) estimating a wage equation regression, and 2) calibrating the labor share in the national income.[32] In a country comparison context, however, this measure could reflect the cost more than the quality of the labor force. Also, and more importantly, globalization in trade, and particularly the role of global value chains (GVCs), could

[32] Wage is regressed on average years of schooling and experience. The latter is calculated as difference between the working age, on the one hand, and the sum of years of schooling and pre-schooling, on the other hand.

be of great importance when interpreting the effect of the human capital wealth measure. In a few words, this measure could obfuscate the income *distributional* dimensions in our context of cross-country comparison. Due to this concern and for checking purposes, I will also use a widely-adopted proxy for human capital that is the average years of schooling by Barro and Lee (2013).

Table 2.3 reports the estimates first without and then with the inclusion of an interaction term between the initial abundance levels of produced capital and human capital. Interestingly, with the interaction term, it turns out that the main effect of human capital becomes positive, while the interaction term dampens the positive relationships between these two types of capital stocks and the subsequent annual averages of net capital inflows. Simply put, given an initial abundance of produced capital, there is an inverted U-shaped relationship between the initial human capital abundance and the subsequent annual average net capital inflows. Overall, the statistical significance is present only with the valuation-adjusted measure of net capital inflows as in columns 2b and 2d. This finding also highlights the importance of a *three*-region rather than a two-region model, which is exactly predicted by Krugman's (1981) uneven development model with perfect capital mobility. The semi-industrialized, middle-income region could grow the fastest because capital would move from the center to semi-periphery rather than the poorest region (pp. 158-160).

In sum, although the findings might seem at first to contrast with our priori expectation, they indeed show the possibility of a positive spillover effect from human capital in middle-income countries. This is a more realistic result based on a three-region model of uneven development with capital mobility as predicted by Krugman (1981).

2.4.2 Comparative Advantage in Financial Assets

Blecker (2005) explains that the classical approach to international economics is based on 1) the comparative advantage theory in goods and services, and 2) balance of payments (BOP) self-adjustment mechanism of David Hume. With capital mobility, however, investors could

*Table 2.3: Testing for a human capital externality in attracting foreign capital (K_P*K_H)*

VARIABLES	(1a) -CA (%GDP)	(1b) ΔNFL (%GDP)	(2a) -CA (%GDP)	(2b) ΔNFL (%GDP)	(2c) -CA (%GDP)	(2d) ΔNFL (%GDP)
Produced Capital Abundance, 1995	0.699*	-0.0414	2.340*	3.960***	0.645	-0.0596
	(0.415)	(0.541)	(1.300)	(0.952)	(0.459)	(0.591)
Net Foreign Assets Abundance, 1995	-2.618***	1.200	-2.945***	0.403	-2.996***	0.989
	(0.851)	(0.921)	(0.880)	(0.868)	(0.848)	(1.009)
Human Capital Abundance, 1995	-0.473**	-0.424***	0.328	1.530***		
	(0.214)	(0.160)	(0.702)	(0.496)		
Subsoil Resource Abundance, 1995	-3.155***	-1.168	-3.160***	-1.180*	-3.391***	-1.688*
	(0.384)	(0.707)	(0.367)	(0.647)	(0.532)	(0.946)
Non-subsoil Resource Abundance, 1995	0.201*	0.0732	0.175*	0.00821	0.202*	0.0289
	(0.102)	(0.147)	(0.101)	(0.101)	(0.119)	(0.210)
KA Openness Chinn-Ito Index, 1995	-0.658	-0.522	-0.899	-1.111	-1.597	-0.712
	(1.819)	(1.269)	(1.766)	(1.176)	(1.680)	(1.253)
Population growth (%), avg. 1996-2015	-0.229	-0.277	-0.186	-0.172	-0.118	-0.181
	(0.210)	(0.215)	(0.212)	(0.181)	(0.216)	(0.200)
Institutional Quality ICRG Index, 1996	-13.92**	-5.722	-14.04**	-6.009	-8.845*	-3.525
	(5.806)	(4.733)	(5.687)	(4.318)	(5.311)	(4.677)
Financial Development Index, 1995	1.708	3.938	2.103	4.902	0.653	2.342
	(4.120)	(3.462)	(4.175)	(3.438)	(4.299)	(3.037)
(Kp*Kh), initial			-0.227	-0.554***		
			(0.174)	(0.136)		
Years of Schooling, 1995					0.247	0.456
					(0.344)	(0.305)
(Kp*schooling), initial					-0.0307	-0.0449*
					(0.0293)	(0.0226)
Constant	11.89***	6.916*	6.063	-7.293*	5.211*	2.220
	(3.925)	(3.690)	(5.971)	(3.965)	(2.922)	(3.219)
Observations	95	95	95	95	87	87
R-squared	0.596	0.195	0.605	0.355	0.620	0.219

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

allocate resources in countries with even an absolute advantage, especially with relatively cheaper labor. Therefore, for Blecker, there is also a comparative advantage in selling financial assets in advanced economies that reflect their ability to sustain CA deficits. In other words, the comparative advantage in financial assets explains the persistent global imbalances.[33] By referring to the doctrine of monetary neutrality, he illustrates that the problems of the mainstream models lie in the separation of trade and finance by assuming financial variables have no real impact.[34] Accordingly, this argument implies an interaction effect between financial system development and NFA position and/or produced capital abundance.

A naïve way of testing for this hypothesis would be via an interaction term, but I should first examine the data on whether higher incomes countries tended to be associated with both highly developed financial systems and net external borrowing positions. Figure 2.3 shows that as income increases, the degree of financial development increases, but the data density raises concerns regarding NFA positions. That is, the horizontal line splits the sample into creditor and debtor countries, reflecting that most countries were net external borrowers (NFA<0) across all the development stages in 1995.

[33] Indeed, this hypothesis is quite similar to a recent neoclassical argument about the capacity of generating safe assets, as in the safe-asset shortage hypothesis by Caballero, Farhi, and Gourinchas (2008, 2017).
[34] It should be also noted that the mainstream economics literature has been increasingly supporting the *non-neutrality* role of money, especially since the 1986 Mussa puzzle—the *simultaneous* increase in volatility of both nominal and read exchange rates in the post-Bretton Woods period. For instance, Nakamura and Steinsson (2018) use high-frequency data and find supporting estimates of the causal effect of monetary shock on fundamental variables. Specifically, they find that "Fed announcements affect beliefs not only about monetary policy but also about other economic fundamentals" (p. 1283). While New Keynesians are mostly known for the assumption of short-term non-neutrality due to nominal rigidities (sticky prices), Itskhoki and Muhkin (2019) also illustrate another possibility and argue for its superiority. They first show that data do not fully support nominal rigidities, then resolve the puzzle through a model of segmented financial market.

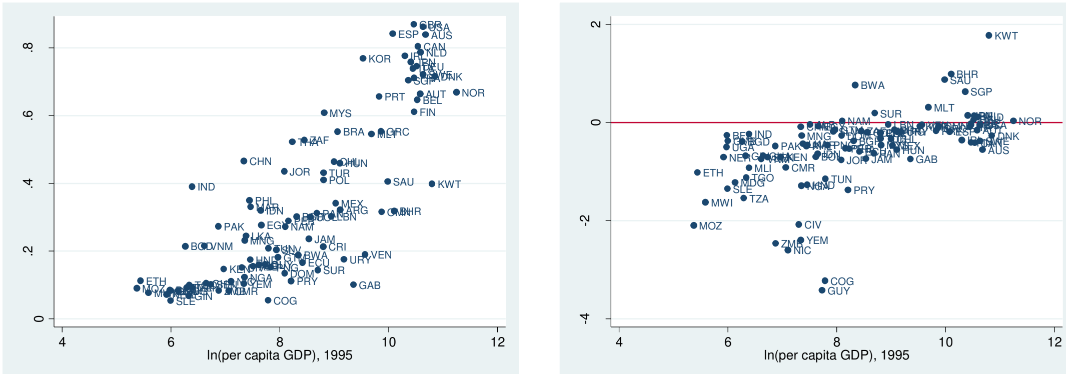


Figure 2.3: The associations between the developmental stage against both financial development and net foreign asset positions, 1995

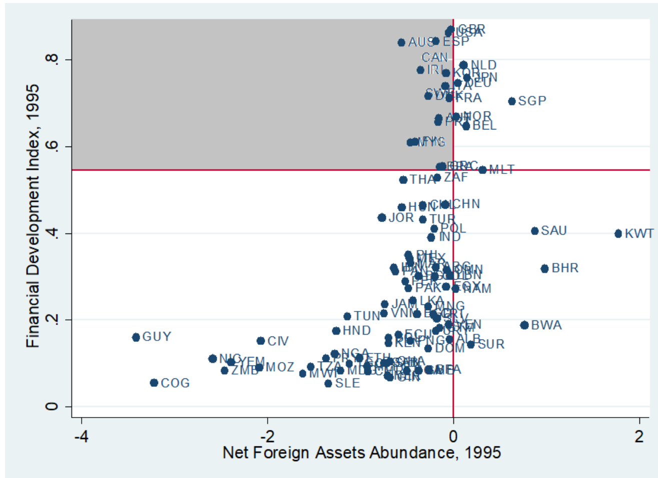
Therefore, I use an identification strategy for the set of countries that are classified with the following two characteristics in 1995 (i.e. the initial year):

1) Being a net external borrower (=NFA<0), and

2) Having a highly financially developed system.

The latter is defined by an arbitrary threshold set at the 75th percentile of the financial system development index. Figure 2.4 plots the observed financial system development index against the NFA-to-GDP ratio in 1995. Our focus, therefore, is on the upper-left quadrant that proxies the set of countries with a comparative advantage in selling financial assets. These countries are considered as our treatment group: Australia, Austria, Brazil, Canada, Finland, France, Greece, Ireland, Italy, Malaysia, Portugal, South Korea, Spain, Sweden, the United Kingdom, and the United States. [35] Instead of the OLS estimator, I could implement the Least Squares Dummy Variable estimator (LSDV), in which a value of one is assigned for these countries that have financially developed systems (D=1) and zero (D=0) otherwise.

[35] Note: the 50th percentile= 0.2772; 75th percentile= .5458; and 90th percentile=0.7458. In the Appendix, Table B3 reports the lists of countries ordered by the highest degree of financial system development index (FD).



Note: The list of countries is reported in the appendix Table B2, sorted by the financial development index in 1995.

Figure 2.4: Financial system development against NFA positions, 1995

Next, I run regressions using: 1) the naïve way through introducing an interaction term, and 2) the superior way through the identification strategy. Table 2.4 reports the regression results for the two methods and the two definitions of net total capital inflows. Results from the naïve method, shown in columns 1a and 1b, suggest for some evidence, especially when using the valuation-adjusted measure of net capital inflows. However, the main effect of financial development still enters with a puzzling negative coefficient but is statistically insignificant, which highlights the weaknesses of the naïve method in testing the hypothesis. More meaningful results, therefore, emerge when implementing the identification strategy. Regression results, reported in columns 2a and 2b, show that the interaction term enters with a negative coefficient. That is, given an initial external debt position (NFA<0), the higher financial development indicates larger net capital inflows, capturing the comparative advantage in financial assets. However, this evidence is statistically significant only when I consider the valuation-adjusted measure of net capital inflows. Moreover, when comparing these two columns, I observe changes in the sign of coefficients of initial NFA abundance and financial development index. This puts emphasis on the role of valuation effects in the international monetary and financial system. Such Trade deficit countries have benefited from their excess returns on their foreign assets over their foreign liabilities. This, in turn, renders, to some extent, a self-adjustment mechanism that explains the discrepancies between the cumulative CA balances and NFA positions.

Table 2.4: Testing for a comparative advantage in financial assets

VARIABLES	(1a) -CA (%GDP)	(1b) ΔNFL (%GDP)	(2a) -CA (%GDP)	(2b) ΔNFL (%GDP)
Produced Capital Abundance, 1995	0.773*	0.144	0.693*	-0.0517
	(0.416)	(0.490)	(0.409)	(0.529)
Net Foreign Assets Abundance, 1995	-1.517	3.951***	-2.377***	1.599*
	(1.558)	(1.174)	(0.806)	(0.889)
Human Capital Abundance, 1995	-0.412*	-0.272*	-0.482**	-0.436***
	(0.226)	(0.145)	(0.216)	(0.165)
Subsoil Resource Abundance, 1995	-2.951***	-0.657	-3.177***	-1.187
	(0.478)	(0.510)	(0.379)	(0.717)
Non-subsoil Resource Abundance, 1995	0.186*	0.0342	0.190*	0.0488
	(0.100)	(0.136)	(0.0983)	(0.145)
KA Openness Chinn-Ito Index, 1995	-0.548	-0.247	-0.797	-0.660
	(1.918)	(1.216)	(2.056)	(1.240)
Population growth (%), avg. 1996-2015	-0.161	-0.105	-0.234	-0.294
	(0.186)	(0.171)	(0.196)	(0.216)
Institutional Quality ICRG Index, 1996	-13.40**	-4.412	-13.21**	-4.279
	(5.796)	(4.269)	(5.209)	(4.521)
Financial Development Index, 1995	-0.0733	-0.510		
	(4.827)	(2.768)		
(NFA*FD), initial	-6.454	-16.11***		
	(7.636)	(4.728)		
Highly Financially developed, (D=1)			-0.0344	0.527
			(2.207)	(1.467)
Comparative Advantage in Financial Asset (-), 1995			-5.225	-7.427***
			(6.727)	(2.696)
Constant	11.13***	5.035	12.26***	7.603*
	(3.883)	(3.210)	(4.304)	(4.120)
Observations	95	95	95	95
R-squared	0.604	0.333	0.605	0.243

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In this regard, Gourinchas and Rey (2005, 2015) illustrate an exorbitant privilege for the US dollar, and mention that that G7 countries have been winners while BRICS countries losers from the valuation adjustments. Gourinchas and Rey (2015) also state, "The valuation channel has historically accounted for roughly 30% of the process of adjustment of the United States toward its long-run solvency constraint." (p. 635) In addition, using a sample of 52 economies over 1990-2015, Adler and Garcia-Macia (2018) find that the valuation changes are driven by asset price changes, rather than yield differentials or exchange rate changes.

2.4.3 Global Saving Glut

Chinn et al. (2014) test for the global saving glut hypothesis, introduced by Bernanke (2005). Their argument is based on interactions between KA Openness (KAO) Financial Development (FD), and Institutional quality (IQ).[36] They call these main variables plus their interactions as the global saving glut variables. It should also be noted this hypothesis is closely related to the export-led growth strategy implemented, for example, by emerging Asia.

However, those three main variables are believed to be highly correlated, and so generating *multiple* interaction terms in the regression analysis is implausible. Although I agree with Balli and Sorensen (2013, p.587) that while collinearity from an interaction should not be a problem, generating *multiple* interactions could raise severe concerns. The correlations between the values of the main variables range from about 0.5 to 0.87 (see Table B2 in the appendix). Thus, introducing three interaction terms out of these variables could be problematic.

Instead of generating interaction terms between these highly correlated variables, I suggest the use of a principal component analysis (PCA) for two reasons. While it could address the multicollinearity, it also renders an easier way of testing for this hypothesis. The latter means

[36] I should note that the proxies used by Chinn et al. (2014) differ from the those of the current study. First, they proxy financial development by the ratio of private credit to GDP, whereas I use the composite broad index of the financial system development introduced by Svirydzenka (2016). Second, they construct an index for institutional quality based on *three* sub-indicators: law and order, bureaucratic quality, and anti-corruption. However, I construct the index using six sub-indicators as discussed earlier in data section. Both of which, therefore, represent an improvement of the current study over the proxy choices.

that I could interpret only one coefficient instead of six. In this procedure, I consider creating a principal component based on two considerations: i) using only the first three variables (IQ, FD, and KAO), and ii) the three main variables plus their three interaction terms.

To justify whether the implementation of PCA is appropriate with our data, I conduct the following investigation. First, by employing a PCA using the three variables (IQ, FD, and KAO) results suggest that only the first principal component has an eigenvalue greater than one (=2.32), which captures the maximal overall variance. In simple words, the first component explains about 77.5% (2.32/3) of the total variance. Also, the values of the factor-loadings are high ranging from about 0.5 to 0.6. I next employ the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (MSA) and find a justification for using the PCA. Kaiser and Rice (1974) suggest that a value of 0.5 or less is unacceptable. Specifically, I find the KMO-MSA index is around 0.62 that is greater than the minimum requirement of 0.5.

Second, by repeating the PCA but for the total of *six* variables (IQ, FD, KAO, and their interaction terms), I find similar qualitative results. Particularly, I only find the first component with an eigenvalue greater that one (=5.06); whereas, the factor-loadings range from about 0.36 to 0.44. Also, the KMO-MSA index is equal to 0.7>0.5, justifying the use of PCA.

Therefore, there is adequate support for the use of PCA in testing for the global saving glut argument by focusing on the same variables as in Chinn, Eichengreen, and Ito (2014). Hence, I could control for the first component, which explains much of the variations in the global saving glut variables.

Table 2.5 columns 1a-2b show regression estimates when control for the first principal component while contrasting the two measures of net total capital inflows. The coefficient on the first component enters with an unexpected sign, implying that less-developed counties (in terms of IQ, FD, and KAO) tend to be associated with larger net capital inflows. For checking purposes, columns 3a-3b control for the main and interaction effects following the method of

Table 2.5: Testing for the global saving glut hypothesis

VARIABLES	(1a) -CA (%GDP)	(1b) ΔNFL (%GDP)	(2a) -CA (%GDP)	(2b) ΔNFL (%GDP)	(3a) -CA (%GDP)	(3b) ΔNFL (%GDP)
Produced Capital Abundance, 1995	0.675	-0.0498	0.652	-0.0502	0.679*	-0.0351
	(0.427)	(0.540)	(0.424)	(0.541)	(0.407)	(0.520)
Net Foreign Assets Abundance, 1995	-2.583***	1.302	-2.698***	1.298	-2.141**	1.298
	(0.827)	(0.876)	(0.825)	(0.887)	(0.910)	(0.851)
Human Capital Abundance, 1995	-0.445**	-0.392***	-0.457**	-0.392***	-0.456**	-0.409***
	(0.207)	(0.148)	(0.214)	(0.147)	(0.193)	(0.152)
Subsoil Resource Abundance, 1995	-3.139***	-1.155	-3.125***	-1.154	-2.884***	-1.008
	(0.415)	(0.722)	(0.424)	(0.722)	(0.403)	(0.699)
Non-subsoil Resource Abundance, 1995	0.181*	0.0678	0.210**	0.0686	0.128	0.0793
	(0.103)	(0.147)	(0.100)	(0.142)	(0.124)	(0.161)
Population growth (%), avg. 1996-2015	-0.141	-0.289	-0.111	-0.288	-0.315	-0.315
	(0.182)	(0.208)	(0.181)	(0.206)	(0.207)	(0.232)
Institutional Quality ICRG Index, 1996					-9.029	-4.108
					(9.540)	(7.928)
Financial Development Index, 1995					-46.03**	-12.38
					(18.21)	(12.80)
KA Openness Chinn-Ito Index, 1995					24.35***	11.92*
					(9.040)	(6.390)
IQ_FD					59.42**	26.53
					(27.16)	(21.43)
IQ_KA					-49.44***	-19.08
					(15.88)	(12.43)
FD_KA					13.47	-1.976
					(13.76)	(11.44)
1st PC (FD,IQ, and KAO), initial	-1.151**	-0.0698				
	(0.458)	(0.411)				
1st PC (FD, IQ, KAO and their interactions), initial			-0.673**	-0.0452		
			(0.301)	(0.260)		
Constant	2.957	4.193*	2.890	4.182*	12.34*	5.455
	(2.421)	(2.303)	(2.459)	(2.327)	(6.409)	(5.573)
Observations	95	95	95	95	95	95
R-squared	0.585	0.183	0.581	0.183	0.634	0.219

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Chinn et al. (2014), but the results are inconclusive. In sum, I find no evidence that supports the global saving glut argument.[37]

2.4.4 Natural Resources Crowd Out Institutions

While Acemoglu et al. (2001) assert that institutional quality is the fundamental cause of economic growth, Gylfason (2004) argue it is all about natural capital that adversely affects growth directly and indirectly through crowding out all other types of capital stocks. In addition, Mehlum et al. (2006a, 2006b) illustrate that only resource-abundant countries with a high quality of institutions could neutralize the resource curse. With regard to capital flows, a number of empirical studies find that the leading factor that explains the Lucas paradox is the institutional quality (Alfaro et al. 2008; Papaioannou 2009). Therefore, I could motivate and test for the interplay between natural capital and institutional quality that is expected to generate a negative spillover effect, so that the allocative efficiency implies less capital should flow in.

Table 2.6 report interesting results while the statistical significance is present only for the case of *subsoil-type* natural resources when valuation effects are incorporated. First, as shown in column 1b, it turns out that the higher initial subsoil abundance, ceteris paribus, tend to be associated with more subsequent annualized average net capital *inflow*, rather than outflows. At first, this exceptional case of the coefficient sign change is puzzling, but interpretations could follow due to the interaction term with institutions. That is, our conceptual framework hypothesizes the efficiency-seeking rather than resource-seeking allocation of international capital flows. All else being equal, the lower quality of institutions suggest more capital inflows,

[37] Some might be concerned with these results due to including the post-GFC period or that the first principal component itself to be correlated with other independent variables. Considering the exclusion of the post-GFC period does not change the results. However, by looking at the simple correlations between the first component and the other explanatory variables, it seems that the effect of the first component overlaps with the effects of the other variables. I find the first component to be correlated with NFA at 0.47, with human capital at 0.4, with subsoil capital at -0.19 and with non-subsoil capital at -0.65. Therefore, the use of PCA seems problematic.

and the interaction amplifies the relationship. This could mean the foreign investors are more likely resource-seeking rather than efficiency-seeking. Consequently, this finding captures the rent-seeking explanation of the natural resource curse phenomenon. Further, the larger net capital inflows imply an appreciation in the exchange rate, so the Dutch disease effects are more likely to materialize in the hosting economy. Accordingly, the two known explanations of the resource curse phenomenon, the rent-seeking activities and Dutch Disease effects, are inferred and seemed to be somehow related to our empirical analysis of international capital flows.

*Table 2.6: Testing for K_N*IQ*

VARIABLES	(1a) -CA (%GDP)	(1b) ΔNFL (%GDP)	(2a) -CA (%GDP)	(2b) ΔNFL (%GDP)
Produced Capital Abundance, 1995	0.715*	0.0627	0.717*	-0.0915
	(0.418)	(0.530)	(0.424)	(0.521)
Net Foreign Assets Abundance, 1995	-2.529***	1.776**	-2.605***	1.163
	(0.909)	(0.716)	(0.857)	(0.903)
Human Capital Abundance, 1995	-0.468**	-0.391***	-0.479**	-0.408***
	(0.212)	(0.146)	(0.214)	(0.153)
Subsoil Resource Abundance, 1995	-2.117	5.522**	-3.156***	-1.164
	(1.806)	(2.262)	(0.385)	(0.732)
Non-subsoil Resource Abundance, 1995	0.198*	0.0504	0.397	-0.472
	(0.104)	(0.151)	(0.406)	(0.435)
KA Openness Chinn-Ito Index, 1995	-0.527	0.322	-0.758	-0.243
	(1.857)	(1.216)	(1.896)	(1.365)
Population growth (%), avg. 1996-2015	-0.217	-0.196	-0.236	-0.258
	(0.209)	(0.149)	(0.209)	(0.207)
Institutional Quality ICRG Index, 1996	-13.04**	-0.0154	-12.35	-10.10*
	(5.913)	(3.825)	(7.631)	(5.578)
Financial Development Index, 1995	1.169	0.462	1.112	5.594
	(4.244)	(2.578)	(4.502)	(3.683)
(IQ*subsoil), initial	-1.879	-12.11**		
	(3.287)	(4.611)		
(IQ*non-subsoil), initial			-0.373	1.036
			(0.775)	(0.879)
Constant	11.39***	3.735	11.17**	8.905**
	(3.868)	(3.004)	(4.522)	(3.886)
Observations	95	95	95	95
R-squared	0.597	0.323	0.597	0.211

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Differently put, and more interesting, given an abundance level of subsoil capital, only countries with *superior* institutions tend to be associated with net capital *outflows* on average. Consequently, this suggests that subsoil-abundant countries with superior institutions are better able to ameliorate the appreciation pressures in the exchange rates, which help mitigate the Dutch disease effects. Further, it implies that they care about intergenerational welfare in which they smooth the use of resource windfalls. In short, only countries with both subsoil resource abundance and high institutional quality, ceteris paribus, tend to associate with higher net capital *outflows* on average.

All in all, such findings suggest the importance of differentiating between *efficiency*-seeking capital flows, as hypothesized in our unified conceptual framework, and *resource*-seeking capital flows. Important policy implications are as follows. Subsoil-rich abundant countries should smooth the use of resource windfalls through foreign reserve management. They should also avoid resource-seeking foreign capital inflows. By doing so, they could ameliorate the appreciation pressures in the exchange rates and, hence, mitigate the Dutch disease effects.

2.4.5 Natural Resource Curse in Finance

Similar to Gylfason's (2004) argument on crowding-out effects, Beck (2011) finds empirical evidence of the so-called “a resource curse in financial development”. In a few words, this is about natural resource-abundant countries that are known to lack development in their financial systems. To some extent, this argument is also related to another that suggests investing rents abroad helps mitigate the macroeconomic volatility effects due to volatile world commodity prices. Commodity-export prices are volatile in international markets, so to mitigate the volatility impact countries need more developed financial systems. However, resource-rich countries lack financial market development which is one of the explanations for the resource curse. Besides, windfalls from a resource boom lead to unsustainable consumption levels. To avoid that, countries could invest in international assets that pay annuities to break out the unsustainable overconsumption argument (Van der Ploeg and Poelhekke 2009; Rodriguez and Sachs 1999). Empirically, Beck (2011) finds that natural capital crowds out the development of financial systems. He concludes that banks in resource-based countries "engage less in intermediation with the real economy" (p. 24). Moreover, he attributes the underdevelopment of finance to supply-side, rather than demand-side, constraints that affect firms more than households.

All the above arguments, therefore, imply an interdependency between financial system development and natural capital abundance. Thus, our priori expectation is as follows: the negative spillover effect, generated by the interaction between natural capital and financial development, should attract little capital inflows or even causes net capital outflows.

Table 2.7 reports the regression results with the decomposition of natural capital abundance into the subsoil and non-subsoil resources. First, the interaction between subsoil abundance and financial development seems to matter, especially with the *valuation-adjusted* net capital inflows as in column 1b. It turns out that the main effect of subsoil abundance becomes positive and significant, while the interaction enters negatively with statistical and economic significance. Conversely, column 2b shows that the main effect of non-subsoil abundance becomes negatively and statistically insignificant while the indirect effect is significantly positive, suggesting mixed results for the case non-subsoil resources. Overall findings show some weakly supporting evidence but only for subsoil types.

Specifically, column 1b of Table 2.7 shows that both main effects of subsoil abundance and financial development enter positively while the interaction term enters negatively, implying a threshold effect or an inverted-U shaped relationship. All else being equal and *below* some threshold of subsoil abundance, an increase in the degree of financial development tends to be associated with net capital inflows.

*Table 2.7: Testing for K_N*FD*

VARIABLES	(1a) -CA (%GDP)	(1b) ΔNFL (%GDP)	(2a) -CA (%GDP)	(2b) ΔNFL (%GDP)
Produced Capital Abundance, 1995	0.698	0.0152	0.693	-0.0267
	(0.421)	(0.521)	(0.441)	(0.469)
Net Foreign Assets Abundance, 1995	-2.637**	2.329***	-2.563***	1.067
	(1.105)	(0.689)	(0.861)	(0.884)
Human Capital Abundance, 1995	-0.475**	-0.327**	-0.501**	-0.357**
	(0.215)	(0.136)	(0.215)	(0.145)
Subsoil Resource Abundance, 1995	-3.195***	1.226**	-3.154***	-1.170
	(0.956)	(0.544)	(0.384)	(0.715)
Non-subsoil Resource Abundance, 1995	0.201*	0.0617	0.319**	-0.209
	(0.103)	(0.128)	(0.159)	(0.130)
KA Openness Chinn-Ito Index, 1995	-0.680	0.830	-1.072	0.471
	(1.971)	(1.285)	(1.981)	(1.392)
Population growth (%), avg. 1996-2015	-0.229	-0.291	-0.248	-0.233
	(0.213)	(0.178)	(0.206)	(0.204)
Institutional Quality ICRG Index, 1996	-13.92**	-5.684	-14.24**	-4.966
	(5.843)	(4.227)	(5.835)	(4.603)
Financial Development Index, 1995	1.726	2.833	2.901	1.080
	(4.188)	(2.727)	(4.389)	(3.643)
(FD*subsoil), initial	0.162	-9.724**		
	(3.543)	(3.807)		
(FD*non-subsoil), initial			-0.930	2.228**
			(1.173)	(0.909)
Constant	11.90***	6.186*	12.42***	5.636
	(3.905)	(3.303)	(4.016)	(3.395)
Observations	95	95	95	95
R-squared	0.596	0.324	0.599	0.249

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

2.4.6 Results of Other Hypotheses

Contrary to the standard neoclassical priori expectations, estimates in columns A1 and A2 of Table 2.8 show a reinforcement of both phenomena: the upstream capital flows and global imbalances. First, on average rich countries, in terms of physical capital abundance, tend to be associated with more net capital inflows, as captured by the positive coefficient. Second, the coefficient on initial NFA is negative, suggesting that creditor (debtor) countries in 1995 have continued being creditors (debtors). This contrasts with the classical self-adjustment mechanism. Finally, and more importantly, the interaction term provides evidence of an amplifying effect against the neoclassical prediction. In other words, external c*reditors,* rich countries have associated, on average, with increasingly larger net capital inflows.

Regarding the interaction between natural capital and physical capital, columns C1-4 of Table 2.8 reports the estimates. Results indicate that there is a dampening effect between the negative (positive) association between initial subsoil (non-subsoil) abundance and subsequent annualized average net capital inflows. However, the coefficient on the interaction term is at best of weak statistical significance at the 10% level.

Moreover, columns D1-D4 of Table 2.8 show that the coefficient on the interaction term of the initial levels of natural resource abundance and NFA is only significant when considering the valuation-adjusted measure of net capital inflows. This supports our hypothesis and indicates that an amplifying negative (positive) relationship between initial subsoil (non-subsoil) abundance and subsequent annualized average net capital inflows.

As predicted by Gylfason (2004), one channel of the resource curse is that natural resource crowds out human capital. In this study, therefore, I expect the negative spillover effect to be associated with larger net capital *outflows*. However, results shown in columns E1-4 of table 9 are still puzzling because the main effect of human capital enters negatively.

Furthermore, results regarding the direct and indirect effect from financial development and physical capital abundance, as shown in columns F1-2 of Table 2.9, are insignificant. Next, results pertaining to the main and interaction effects of financial development and human capital are shown in column H1-2. The main effects still enter with counter-intuitively negative signs while only the interaction term enters positive as expected. Since these estimates are puzzling, I find inconclusive evidence. Moving on to the hypothesis of the interdependency between initial physical abundance and institutional quality, results are reported in columns J1-2. The coefficients on the main and interaction effects are all statistically insignificant.

Finally, the estimates for the interdependency between the initial institutional quality and NFA position are reported in columns K1-2 of Table 2.9. However, the direct effect of institutional quality still enters with an unexpected negative sign, suggesting the results are inconclusive.

Table 2.8:

VARIABLES	(A1) -CA (%GDP)	(A2) ΔNFL (%GDP)	(C1) -CA (%GDP)	(C2) ΔNFL (%GDP)	(C3) -CA (%GDP)	(C4) ΔNFL (%GDP)	(D1) -CA (%GDP)	(D2) ΔNFL (%GDP)	(D3) -CA (%GDP)	(D4) ΔNFL (%GDP)
Produced Capital Abundance, 1995	1.652***	1.332***	0.599	-0.861	1.528**	0.585	0.699	-0.0382	0.729**	0.0431
	(0.437)	(0.450)	(0.605)	(0.674)	(0.683)	(0.698)	(0.421)	(0.485)	(0.362)	(0.355)
Net Foreign Assets Abundance, 1995	-5.889***	-3.514**	-2.606***	1.300*	-2.312**	1.431*	-2.771*	3.670***	-3.682***	-1.801
	(1.465)	(1.580)	(0.858)	(0.736)	(0.879)	(0.847)	(1.476)	(0.981)	(1.168)	(1.195)
Human Capital Abundance, 1995	-0.367*	-0.272*	-0.475**	-0.437***	-0.468**	-0.421**	-0.476**	-0.386***	-0.441**	-0.335**
	(0.208)	(0.138)	(0.215)	(0.150)	(0.216)	(0.164)	(0.216)	(0.127)	(0.216)	(0.141)
Subsoil Resource Abundance, 1995	-2.961***	-0.888*	-3.474***	-3.766*	-3.152***	-1.166*	-3.134***	-1.512***	-3.032***	-0.822
	(0.327)	(0.513)	(1.231)	(2.047)	(0.355)	(0.668)	(0.433)	(0.449)	(0.412)	(0.530)
Non-subsoil Resource Abundance, 1995	0.115	-0.0504	0.206*	0.110	0.552**	0.339	0.198*	0.131	0.344**	0.477***
	(0.102)	(0.116)	(0.109)	(0.131)	(0.238)	(0.312)	(0.103)	(0.123)	(0.141)	(0.172)
KA Openness Index, 1995	-1.131	-1.203	-0.683	-0.730	-0.750	-0.591	-0.735	0.716	-0.361	0.315
	(1.744)	(1.111)	(1.869)	(1.393)	(1.754)	(1.235)	(1.953)	(1.261)	(1.910)	(1.275)
Institutional Quality Index, 1996	-12.87**	-4.199	-13.82**	-4.898	-13.08**	-5.082	-13.92**	-5.822	-13.04**	-3.237
	(5.673)	(4.403)	(5.948)	(4.521)	(5.669)	(4.381)	(5.869)	(3.853)	(5.899)	(4.274)
Financial Development Index, 1995	0.378	2.021	1.805	4.728	1.023	3.420	1.853	1.600	2.045	4.889
	(4.023)	(3.237)	(4.196)	(3.538)	(4.204)	(3.346)	(4.262)	(2.683)	(4.067)	(3.287)
KPxNFA	0.732***	1.055***								
	(0.214)	(0.247)								
KPxKsubs			0.0872	0.711*						
			(0.327)	(0.415)						
KPxKnonsubs					-0.0747	-0.0565				
					(0.0528)	(0.0765)				
KFxKsubs							0.0771	-1.244***		
							(0.419)	(0.364)		
KFxKnonsubs									0.163	0.460***
									(0.120)	(0.158)
Observations	95	95	95	95	95	95	95	95	95	95
R-squared	0.625	0.376	0.597	0.259	0.606	0.212	0.597	0.373	0.604	0.371

Note: All regressions are run while controlling for the annualized averages of population growth and a constant. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2.9:

VARIABLES	(E1) -CA (%GDP)	(E2) ΔNFL (%GDP)	(E3) -CA (%GDP)	(E4) ΔNFL (%GDP)	(F1) -CA (%GDP)	(F2) ΔNFL (%GDP)	(H1) -CA (%GDP)	(H2) ΔNFL (%GDP)	(J1) -CA (%GDP)	(J2) ΔNFL (%GDP)	(K1) -CA (%GDP)	(K2) ΔNFL (%GDP)
Produced Capital Abundance, 1995	0.869**	-0.00727	0.689*	-0.0591	0.105	-0.798	0.774*	0.00664	0.229	-1.963	0.703*	-0.0321
	(0.412)	(0.545)	(0.411)	(0.512)	(0.537)	(0.677)	(0.435)	(0.561)	(2.109)	(2.344)	(0.420)	(0.551)
Net Foreign Assets Abundance, 1995	-3.271***	1.069	-2.637***	1.166	-2.672***	1.132	-2.444***	1.311	-2.615***	1.214	1.055	10.15*
	(0.871)	(0.989)	(0.851)	(0.859)	(0.832)	(0.880)	(0.858)	(0.887)	(0.847)	(0.920)	(5.354)	(5.122)
Human Capital Abundance, 1995	-0.134	-0.356**	-0.268	-0.0526	-0.379*	-0.304*	-0.999***	-0.760**	-0.457**	-0.360**	-0.426*	-0.310**
	(0.201)	(0.162)	(0.263)	(0.157)	(0.215)	(0.155)	(0.320)	(0.297)	(0.230)	(0.157)	(0.228)	(0.142)
Subsoil Resource Abundance, 1995	2.130	-0.104	-3.209***	-1.266*	-3.077***	-1.069*	-3.260***	-1.235*	-3.146***	-1.132	-3.072***	-0.965
	(1.528)	(1.325)	(0.376)	(0.673)	(0.365)	(0.632)	(0.368)	(0.715)	(0.391)	(0.684)	(0.406)	(0.596)
Non-subsoil Resource Abundance, 1995	0.0994	0.0528	0.528**	0.664**	0.187*	0.0555	0.176*	0.0572	0.197*	0.0566	0.202**	0.0748
	(0.111)	(0.149)	(0.247)	(0.304)	(0.0965)	(0.136)	(0.106)	(0.141)	(0.102)	(0.136)	(0.0994)	(0.163)
KA Openness Index, 1995	-0.640	-0.518	-0.522	-0.276	-1.155	-1.155	-0.444	-0.385	-0.693	-0.666	-0.598	-0.376
	(1.837)	(1.289)	(1.866)	(1.266)	(1.773)	(1.249)	(1.870)	(1.280)	(1.861)	(1.283)	(1.896)	(1.246)
Institutional Quality Index, 1996	-14.21**	-5.780	-13.92**	-5.717	-15.30**	-7.472	-12.89**	-5.063	-17.09	-18.69	-16.27**	-11.45*
	(5.709)	(4.729)	(5.869)	(4.519)	(6.110)	(5.361)	(5.812)	(4.576)	(13.85)	(16.98)	(7.376)	(5.801)
Financial Development Index, 1995	1.295	3.855	0.491	1.735	-10.78	-11.97	-13.63*	-5.849	1.645	3.681	2.019	4.695
	(3.861)	(3.440)	(4.143)	(3.118)	(10.46)	(11.80)	(8.192)	(6.422)	(4.177)	(3.457)	(4.077)	(3.401)
KHxKsubs	-0.857***	-0.173										
	(0.255)	(0.265)										
KHxKnonsubs			-0.0439	-0.0794**								
			(0.0312)	(0.0324)								
KPxFD					3.435	4.375						
					(2.444)	(3.085)						
KHxFD							1.446**	0.923				
							(0.653)	(0.573)				
Kp*IQ									0.807	3.302		
									(3.398)	(3.979)		
KFxIQ											-6.433	-15.68*
											(9.255)	(8.644)
Observations	95	95	95	95	95	95	95	95	95	95	95	95
R-squared	0.628	0.199	0.603	0.260	0.607	0.248	0.612	0.215	0.597	0.209	0.600	0.260

Note: All regressions are run while controlling for the annualized averages of population growth and a constant. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

2.5 Summary

This section contrasts all priori expectations to the corresponding empirical results. Table 2.10 provides a summary of the specific complementarity and tradeoff effects on cross-border capital flows.

Table 2.10: Summary of the complementarities and tradeoffs

Complementarity/ Tradeoff	Expectation	Results	Notes
a. K_P*NFA	(-): Neoclassical priori	(+): Exacerbating the upstream flows	The opposite effect supports the empirical literature but even shows an amplification effect.
b. K_P* K_H (Refer to subsection 2.4.1)	(+): Positive spillover effect as in Lucas (1990)	Before interacting, the main effect of human capital enters negatively. After interacting, it becomes positive while the interaction term is negative. This finding supports the prediction of Krugman's (1981) 3-region model. (+): for middle-income, semi-industrialized region*	*Intriguing findings, but the statistical significance is present only when using the valuation-adjusted measure of capital flows.
c. K_P*K_N	(-): given a high initial resource abundance, more accumulation of physical capital has diminishing returns as in the neoclassical theory, or as in Nili and Rastad (2007) who argue about frictions in the financial systems in resource-rich countries. Therefore, such a negative interdependency could *exacerbate* the outflows from resource-rich countries.	(+): There is a *dampening* effect on the negative association between subsoil abundance and net capital inflows but, at best, is weakly significant.	
d. NFA*K_N	(-/+) amplification effects for subsoil and non-subsoil, respectively	Significant findings but only when valuation effects are incorporated	This supports my previous paper's argument that subsoil-abundant countries tend to be net external creditors and, hence, explains the upstream capital flows.
e. K_H*K_N	(-): natural capital crowds out human capital (Gylfason 2004), so the negative interdependency should tend to lower both growth rates and net capital inflows.	Puzzling results because the main effect of human capital still enters negatively	
f. K_P*FD	(-) Given an initial high physical capital, the more developed financial system should reduce the need for net capital inflows.	Insignificant results with an unexpected sign on the interaction term coefficient	
g. NFA*FD (Refer to subsection 2.4.2)	(-): Blecker's (2005) explanation of the comparative advantage in financial assets	Supporting evidence especially with the role of valuation effects.	A major finding of the paper because I develop a way of testing the hypothesis
h. K_H*FD	(+): both are considered as absorptive capacities (Alfaro et al. 2004; Borensztein et al. 1998), so the positive interdependency should be associated with higher capital inflows.	Main effects, however, enter negatively, making it a puzzling argument.	

Complementarity/ Tradeoff	Expectation	Results	Notes
i. K_N*FD (Refer to subsection 2.4.5)	(-): Natural resources curse financial development (Gylfason 2004; Beck 2011), so the negative interdependency should be *negatively* associated with net capital inflows.	At best, there is some weak evidence for the case of *subsoil* resources, and when considering the valuation-adjusted measure of capital flows.	
j. K_P*IQ	(+): the Lucas' (1990) paradox is explained by the superior institutions in advanced countries (Alfaro et al. 2008; Papaioannou 2009)	Insignificant results.	
k. NFA*IQ	(-): this is also related to the hypothesis (j) that net debtor advanced countries were able to sustain CA deficits due to their superior institutions.	At best there is a weakly significant interaction term, but the main effect of institutions is counter-intuitive with a negative sign.	
l. KN*IQ (Refer to subsection 2.4.4)	(-): Gylfason's (2004) crowding-out argument as an indirect channel of the resource curse, so such a negative interdependency should attract lower capital inflows.	(+): a higher abundance of *subsoil* assets and lower quality of institutions tend to attract *larger* net capital inflows, suggesting that capital inflows are more likely to be *resource*-seeking than *efficiency*-seeking.	Although our conceptual framework concentrates on the efficiency-seeking allocation of capital flows, this finding highlights the harmful role of resource-seeking foreign inflows.
m. FD*IQ (*KAP) (Refer to subsection 2.4.3)	(+): Chinn et. (2014) test the global saving glut hypothesis by arguing that the *lower* values of the global saving glut variables explain the upstream capital inflows.	Inconclusive results	

2.6 Discussion and Conclusion

In this chapter, I synthesize the literature of international finance and sustainable development using an extended, open-economy, growth framework with a broad definition of wealth. Overall findings suggest that the composition of wealth is critical in analyzing capital flow movements and global imbalances. More importantly, the departure from an overall complementarity to specific complementarities and tradeoffs in capital stocks allows us to test for a wide set of arguments discussed in the literature of capital flows, natural resource development, and global imbalances.

Some of the main findings are as follows. First, many hypotheses are empirically supported especially when considering the valuation-adjusted, rather than the typical, measure of net capital inflows. The role of valuation effects (VEs) has been documented in recent studies and even in the IMF periodical reports (Gourinchas and Rey 2015; Adler and Garcia-Macia 2018; International Monetary Fund 2019a). For instance, the 2019 IMF external sector report shows that the post-period of 2008-9 global financial crisis (GFC), imbalances in the CAs have narrowed but increased in the NFA positions. While the former mostly captures the trade channel, the latter is about the increasingly important role of valuation effects. Second, I find evidence on an *amplification* effect that external debtor countries with high physical abundance in 1995 tend to be associated with annualized average net capital *inflows*, rather than outflows, over the subsequent two decades. This contradicts the standard neoclassical theory prediction that capital should flow to capital-scarce economies. In a few words, this finding shows supporting evidence on the allocation puzzle against the neoclassical allocative efficiency. Third, human capital seems to generate an externality that affects capital flows, but it seems to hold as an inverted U-shaped relationship. This indicates the positive spillover effect from human capital is of great importance to semi-industrial, middle-income countries. Indeed, Krugman (1981) predicts that based on his uneven development model when considering a three-region world with perfect capital mobility. In addition, this evidence supports the arguments about global value chains in which multinational corporations operate in fragmented production processes to minimize the cost of their final products. In other words, they could even exploit absolute rather than comparative advantages worldwide. Indeed, Palley (2015) insists on the role of global value chains (GVCs), which he particularly describes as “barge economics”, to explain the persistent global imbalances. He elaborates and criticizes the mainstream explanations for global imbalances because they are based on the claim of “large benefits from neoliberal globalization” (p. 47). Fourth, I motivate a way of testing for Blecker's (2005) argument of the comparative advantage in financial assets, and find supporting evidence especially when valuation effects are incorporated. Consequently, all these explanations indicate that the persistent global imbalances phenomenon is inevitable in the current international monetary and financial system (IMFS).

The sustainable open-economy growth framework with the broad definition of wealth, utilized in the current study, helps us better understand the current IMFS. Financial globalization provides benefits and harms to individual economies and the global economy. For instance, the IMF analyzes global imbalances based on two components: healthy and risky (see, Obstfeld 2017; International Monetary Fund 2019). The overall findings of the current study put emphasis on the role of wealth composition when analyzing sustainable economic development and international financial linkages.

The findings of this chapter, therefore, could suggest different policy implications for i) advanced economies (AEs) with CA deficits, ii) resource-rich countries, and iii) other emerging markets and developing economies (EMDEs) especially those with excess-savings. First, AEs with both CA deficits and highly developed financial systems have benefited from the current international monetary and financial system only through the role of valuation effects. Thus, the role of both the financial system development and the valuation effects shows that some advanced countries have benefitted asymmetrically from the current (IMFS), particularly due to the dominance of the US dollar. This sheds light on the importance of reforming the current IMFS, which is known as a system of floating dollar standard, to address core-periphery issues (see, e.g., Vasudevan 2009). On the other hand, financial liberalization allows subsoil-rich economies to smooth the use of windfalls through foreign reserves accumulation, which also helps to ameliorate the appreciation pressures in the exchange rates. The appreciation of the exchange rates means the Dutch disease effects could materialize in the resource-abundant countries. Other developing countries with CA surpluses due to over savings, rather than low imports, reflect the flaws associated with the current IMFS. This is because their foreign reserve accumulation is mostly driven by *precautionary*, rather *productive*, motives, especially after the 1997 Asian financial crisis. Nevertheless, this is also related to the export-led growth strategy in which these countries have managed their exchange rates and capital inflows to maintain their export competitiveness. For instance, this argument is known as the revived Bretton Woods System (BWS) or the BW II era (see, Dooley, Folkerts-Landau, and Garber 2004). Therefore, the East Asian countries seem to have learned the crisis lesson by maintaining the competitiveness of their exports while managing the risk of fickle private capital flows through the accumulation of foreign reserves. At first, the demand for their exports had helped them to recover relatively faster from the crisis, and then they have managed to run current account surpluses and to accumulate foreign reserves. In turn, the accumulated financial buffers have helped them, against the risks of sudden stops in capital inflows and have kept their exchange rates favorable for their export-led growth model.

Chapter 3

International Capital Flows: Heterogeneities in Investor Types and in Countries' Wealth Compositions and Demographic Structures

3.1 Introduction

In previous work, I conceptualized a unified sustainable economic growth model with a broad definition of wealth to analyze international capital flows. While findings show the importance of wealth compositions, there was no evidence supporting the allocative efficiency of capital flows. That result could be attributed to the focus on net total capital inflows in the study, following the Ramsey-Cass-Koopmans model assumptions. Specifically, it is based on a forward-looking, infinitely lived agent (ILA), and is consistent with Friedman's permanent income hypothesis (PIH).

In contrast, the current study utilizes different insights from the overlapping generations (OLG) models, as in Diamond (1965), to predict capital flows through the saving-investment relations. Further, OLG models are consistent with the Life Cycle Hypothesis (LCH). Interestingly, the OLG models are more general than ILA models, especially in predicting saving-investment decisions and, hence, in predicting capital flows. If and only if there are *identical* overlapping generations and the Ricardian equivalence (RE) of taxes and debts holds true, then the intertemporal budget constraint of the OLGs is equivalent to that of the ILA. However, the RE has been theoretically and empirically challenged, and the assumption of identical OLGs is implausible due to the contemporary phenomenon of the aging population. While the former implies that private and public savings do not need to exactly offset each other in the intertemporal equilibrium, the latter is about the advanced stages of demographic transition. Population aging occurs when longevity or life expectancy increases, the working-age remains the same, and fertility or population growth declines. Both reasons motivate the current study and suggest further investigations of capital flows based on the distinction between private and official flows and the distinction between demographic structures across countries.

Separate examinations of private versus official flows could reveal different patterns. *Private* flows are believed to be allocated to the most profitable opportunities, whereas *official* flows are probably allocated for different economic or even political considerations than efficiency (e.g. Lowe et al. 2019). Previous studies have found that private flows validate the efficient allocation hypothesis (Aguiar and Amador 2011; Alfaro et al. 2014; Gourinchas and Jeanne 2013; Papaioannou 2009). Alfaro et al. also find evidence that public debt flows only from private *creditors* follow the efficient allocation hypothesis.

Moreover, OLGs models highlight the role of demographic structures. "Saving patterns typically change with age: the young borrow, prime working-age individuals save, and the old dissave after retirement." (Amaglobeli et al. 2019. p.6). Also, the IMF's external balance assessment framework considers CA imbalances to be even necessary for the case of rich, population-aging countries (see Obstfeld 2017). The saving-investment decisions influence the net national saving captured by the CA balances (or net total capital outflows).

In this study, therefore, I investigate how relaxing the underlying assumptions of the Ricardian equivalence improve the predictions of aggregated and disaggregated international capital flows. An overview of the main findings suggests the following. The inclusion of demographic structures seems to correct the bias in the estimates. Also, there is, at best, weak evidence on the allocative efficiency of total capital flows in the pre-crisis period. Further, the decomposition of total wealth is critical, and findings highlight the initial levels of subsoil natural capital and NFA positions. Regarding disaggregated capital flows, there is some weak evidence on the allocative efficiency of total *private* flows in the pre-crisis period, unlike the case of official flows. Moreover, there are stark differences due to the role of institutional quality and the development of financial systems when considering further disaggregation of private flows into portfolio flows, FDI, public and publicly guaranteed (PPG) and non-guaranteed (NG) debt flows. These empirical findings lead to some policy implications, which are discussed in the conclusion section.

The paper proceeds as follows. The next section discusses the theoretical predictions and issues, while substantiates the role of demographic factors and disaggregation of capital flows. Section 3.3 reports and discusses data sources and the empirical approach. Section 3.4 revisits the wealth composition and allocative efficiency hypotheses for total capital flows after the inclusion of demographic factors. Similarly, section 3.5 investigates these hypotheses but for disaggregated capital flows into private and official, and then conducts a further investigation of their components. Section 3.6 discusses the main findings and concludes with some policy implications.

3.2 Theoretical Predictions and Issues

In most neoclassical models, what mostly matters is the *intertemporal,* rather than the *single-period*, equilibrium of the economy. Economies could run imbalances in their CA and NFA positions during the transition toward their steady-state equilibrium. For example, the standard Ramsey-Cass-Koopmans model assumes an intensive-form production function as $y=Af(k)$ with diminishing marginal productivity of capital. During the convergence process, therefore, capital should flow from capital-abundant (or rich) countries to capital-scarce (or poor) countries.

Let us start off with two identities that capture the stock-flow movements in a country's net foreign asset position:

$$NFA = \sum CA + VEs$$

$$\text{If } VEs=0, \text{ then } CA=\Delta NFA \qquad (3.1)$$

Therefore, I could summarize many important relations in the following main identity that will be sufficient-enough for our motivation and illustration purposes:

CA = (T-G) + (S-I) = (Net Public Saving) + (Net Private Saving) = Net National Saving

= Net Total Capital Outflows

= Net Private Capital Outflows + Net Public Capital Outflows (3.2)

Now consider a simple case of an open economy with balanced government budgets. This means that imbalances in CA would be driven by the individuals' saving-investment decisions. In representative agent models with perfect foresight, the forward-looking infinitely lived agent (ILA) maximizes and smooths consumption levels over time. This is consistent with Friedman's (1957) Permanent Income Hypothesis (PIH).[38] In other words, the economy's equilibrium requires the consumer to maintain the *intertemporal* budget constraint.

The Ricardian equivalence of taxes and debts relaxes the assumption of a balanced budget in every time period but requires maintaining the intertemporal budget constraint of the government besides that of the individuals. First, if both intertemporal budget constraints of the ILA and government hold, the economy achieves its equilibrium. Second, consider overlapping generations (OLG) models with two periods and two generations. It should be noted that the

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[38] Simply put, the ILA seeks to smooth consumption, rather than output, levels over time through lending/borrowing in the international capital markets.

adoption of the OLG model to explain the Ricardian Equivalence was first illustrated by Barro (1974, 1979). If the government decides to run a deficit in the current period, the young generation would save because they anticipate higher taxes when getting old, following the life-cycle income hypothesis. Thus, these simple cases illustrate consistent results between ILA and OLG models in predicting saving-investment decisions and, hence, in CA movements or net capital inflows, as shown in equation (3.2). Due to the assumption of diminishing marginal product of physical capital, the allocative efficiency suggests that capital should flow from rich to poor countries, which could grow faster during the convergence process.

If and only if some assumptions are satisfied, OLG models as in Diamond (1965), which are consistent with Modigliani's (1963) Life Cycle Hypothesis (LCH), suggest that individuals work and save when they are young to finance their retirement when they get old. Thus, the CA surplus and deficit would exactly offset each other when they die. Consequently, both the ILA and OLGs models seem to rely on the Ricardian equivalence (RE) of taxes and debt. In other words, private and public savings exactly offset each other in the economy's equilibrium (see, e.g., Obstfeld and Rogoff 1996).

Nevertheless, the Ricardian equivalence (RE) has strong theoretical challenges. It fails when considering distortionary rather than lump-sum taxes, and when consumers cannot borrow at the same rates as governments. Moreover, although David Ricardo (1951, pp. 247-9) himself illustrated the theoretical equivalence, he concluded with its irrelevance to apply in practice. He even warned against high levels of public deficits and debts because capital could move abroad to avoid taxes, which in turn makes it harder to service the debts (Obstfeld and Rogoff 1996, p.131).

Besides the theoretical challenges, the RE has empirically failed. Gourinchas and Jeanne (2013) states the empirical failure of the RE due to financial frictions, so that private and public savings need not offset each other (p. 1504). Thus, the distinction between private and official capital flows deserves a further investigation, especially within our unified sustainable growth framework with the broad definition of total wealth accumulation.

Furthermore, differences in demographic trends play a critical role in the OLG models, even with the case of lump-sum taxes. Previously, I implicitly assumed that the economy is inhabited by identical generations across all time periods. Thus, those who received lump-sum transfers when young would be the same ones who pay taxes when old. But if the generations are unrelated and non-identical, a current government deficit implies a redistribution of income from the future to the young generations, especially if the country has easy access to the international capital markets. In other words, the current young generation would benefit at the expense of a higher tax burden on future generations. Also, the wide macroeconomic literature emphasizes the role of aging societies. The aging population phenomenon refers to declining fertility and rising life expectancy, while the working-age has remained unchanged (see, e.g., Cooper 2008; Amaglobeli et al. 2019; International Monetary Fund 2019). Thus, aging requires more saving for retirements and for the uncertainty in medical advancements. Differences in demographic trends could affect the CA through the saving-investment decisions of both the individuals and the government. The latter of which, for example, involves policy changes regarding pension funds and social safety net programs. The OLG is better suited for capturing the aging population effects on the investment-saving relationship and, hence, on the current account imbalances. In short, the demographic transition plays a critical role in analyzing macroeconomic effects on saving-investment decisions and therefore on external imbalances.

Accordingly, sections 4 and 5 consider the role of demographic transitions in predicting total and disaggregated capital flows, respectively. In doing so, I will consider three population groups: the youth (<15 years old), the working age, and old (>65 years old). Focusing on the productive working-age group, I could consider two relative dependency ratios for the youth and the old, as in Chinn and Prasad (2003). Specifically, I could examine the hypotheses regarding the allocative efficiency, wealth composition, and demographic structures for both total and disaggregated capital flows.

I relax the strong assumptions behind the Ricardian equivalence. First, real-world taxes are not only in the form of lump-sum taxes, thus the intertemporal or intergenerational transfers do not exactly offset each other. Second, if the demographic profile differs between the generations as in the OLGs models, then the lump-sum taxes and transfers do not offset exactly each other. The proposition is emphasized by the aging population phenomenon that has been suggested as an explanation for Japan and Germany's CA surpluses (see, e.g., Cooper 2008; Chinn and Prasad 2003; Obstfeld and Rogoff 1996). Thus, relaxing the assumption of identical generations matters not only for disaggregated but also for aggregated capital flows. Using the CA identity (as in equation 2), it implies that even within the intertemporal setting, private and public capital flows do not necessarily need to exactly offset each other. In fact, this supports real-world data of the persistent global imbalances.

Based on the above, I will revisit the allocation efficiency and wealth composition hypotheses while controlling for demographic factors in prediction capital flows. After discussing the data sources and the empirical approach, section 4 analyzes the case of net *total* capital inflows. Then section 5 conducts detailed analyses for disaggregated capital flows because official flows involve not only profitability but also political and economic policy aspects.

3.3 Data Sources and Empirical Approach

Data are available from the primary sources: the International Monetary Fund (IMF)-International Financial Statistics (IFS), World Bank (WB)- Wealth Accounting database (WA) and World Development Indicators (WDI), along with a constructed database by Alfaro et al. (2014) who separate private from official flows. Moreover, data on the valuation-adjusted net inflows are from the Lane and Milesi-Ferretti (2007, 2017). It should be noted that since the available dataset by Alfaro et al. (2014) only covers non-high-income EMDEs, this will restrict the sample in our analyses of *disaggregated* capital flows. However, considering further disaggregation of private flows allows us to expand the country sample, as we will see in a later analysis.

I employ an OLS regression analysis with robust standard errors, while adapting the specification of Gourinchas and Jeanne (2013), and start off with a sample of 95 AEs and EMDEs over 1995-2015 to analyze total capital flows. As documented in my previous work excluding AEs from the sample did not cause qualitative changes. I then adopt definitions used in the literature to analyze disaggregated capital flows. Due to data restrictions, I start using a sample of 69 non-high-income EMDEs over 1995-2014 to analyze disaggregated capital flows, but more disaggregated data allows us to extend the sample of countries. Specifically, I run the annualized averages of net capital inflows on the annualized averages of real per capita growth, young and old dependency ratios, and the lagged initial abundance measures of wealth compositions. This is an attempt to mitigate the simultaneity bias concern. That is, while controlling for the lagged initial abundance measures, I could examine the allocative efficiency hypothesis— the relationship between net capital inflows and productivity growth. Also, this specification allows testing for the role of different abundance measures in driving capital flows. Therefore, the main empirical specification could be illustrated as follows:

$$\left(\frac{F}{Y}\right)_{avg,\,i} = \alpha_0 + a_1 . \left(g_y\right)_{avg,\,i} + DF'_{avg,\,i} . \vartheta + W'_{1995,i} . \beta + Z'_{1995,i} . \gamma + \varepsilon_i \qquad (3.3)$$

The dependent variable (F/Y) refers to annual averages of net *total* and *disaggregated* capital inflows (private, public, and sovereign) from 1996 onward, expressed as a percentage of GDP. When applicable, I contrast the typical historical measures of capital flow with those adjusted for market valuations as in Lane and Milesi-Ferretti (2007, 2017). On the right-hand side, the variable g_y refers to annualized averages of real per capita growth rates in GDP. The vector DF refers to demographic factors that include annualized averages of population growth, and of young and old dependency ratios. Specifically, a population of a country is divided into three groups: the working-age population, the young and old non-working population. So that I could examine the role of cross-country differences in the two relative dependency ratios on international capital flows.

Moreover, The vector W refers to the set of the wealth components as defined by Lange et al. (2018), and are constructed as initial abundance measures ($\frac{k_P}{y}, \frac{k_F}{y}, \frac{k_H}{y}$, and $\frac{k_N}{y}$) in 1995. Both the numerator and denominator are in per capita units and based on constant prices in 2014 USD at market exchange rates. Also, the vector Z refers to the wealth index proxies, following the definition of wealth by Gylfason (2004). They are captured by composite indexes for financial system development and institutional quality; along with an index for capital account openness. Specifically, I use constructed composite indices for financial system development by Svirydzenka (2016), and a *de jure* capital account openness index by Chinn and Ito (2006). I also construct a composite equally weighted-index for institutional quality from the six sub-indicators available in the Political Risk Services- International Country Risk Guide (ICRG) database. Due to concerns of the 2008-09 Global Financial Crisis (GFC), which could affect the relationship between capital flows and real growth, I include intercept and slope differentials in some specifications.[39]

It should be noted that while Gourinchas and Jeanne (2013) control for population growth, I also consider the inclusion of young and old dependency ratios. Thus, these variables reflect the current study's motivation to examine differences in the profile of OLGs across countries. Specifically, it is about the aging population argument— relatively old-populated rich economies tend to save more for retirement and, hence, are more likely to be net external lenders.

3.4 Total Capital Flows

This section compares ILA and OLG models in predicting net *total* capital flows through the role of demographic structures. Empirically, this could be thought of as whether there is an omitted relevant variable bias. In my previous work, I regressed annualized averages of net total capital flows on annualized averages of real per capita growth rates and initial wealth abundance measures. The current study will also consider whether young and old dependency ratios are relevant to the model's specification. If so, then the question arises whether correcting the bias of the estimates would make remarkable differences in my previous work's main findings. Specifically, I found significant negative effects from two initial abundance measures: subsoil natural capital and NFA position, especially when considering the typical measure of capital flows. Nevertheless, there was no evidence on the allocative efficiency.

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[39] In the structural-break specification, the number of observations doubles due to splitting the sample into pre- and post-crisis periods.

Table 3.1 reports regression estimates with the inclusion of young and old dependency ratios. While I consider two measures of net total capital flows, two specifications are run where one allows for a structural break due to the 2008-9 on the relationship between capital flows and real growth rates. Overall results indicate that the inclusion of the dependency ratios does not *qualitatively* change my previous work's results regarding initial abundance measures of NFA and subsoil resources. Interestingly, the slight *quantitative* changes are due to the inclusion of what seems to be relevant variables of dependency ratios. For example, when using the typical CA measure, I find here a coefficient on subsoil natural capital of about -2.9 compared with -3.17, while the economic significance of these effects almost remains the same. All else being equal, an increase by one standard deviation (=1.14) in the ratio of subsoil capital to GDP in 1995 is associated with a decrease of about 3.30-3.61 percentage points in the ratio of the subsequent annualized average of net capital inflows to GDP during 1996-2015.

In addition, while using the valuation adjusted measure of capital flows, as shown in columns 2.a and 2.b, I observe a consistent finding with my previous study that the coefficient on initial NFA is positive but only weakly significant at best. This suggests, to some extent, a stabilizing role of valuation effects. Furthermore, column 2b shows that there is, at best, very weak evidence on the allocative efficiency before the 2008-9 GFC at the 10% significance level. In the appendix, I also consider some alternative specifications and find the statistical significance of the allocative efficiency to become stronger in the pre-crisis period.[40]

[40] In the appendix, I consider many specifications concerned about whether there are differences when using *aggregated* natural capital (instead of the decomposition of subsoil and non-subsoil) and *total* dependency ratio (instead of the young and old dependency ratios). Overall, Tables C1.1-2 show no much differences, except that the evidence on the allocative efficiency becomes more statistically and economically significant. Moreover, since our data on disaggregated capital flows mostly available until 2014, I examine the exclusion the year of 2015 from the sample. Tables C1.3-4 show some changes but, most importantly, that the role of valuation effects becomes more statistically significant, as captured by a positive coefficient on initial NFA positions when considering the valuation-adjusted measure of capital flows as our dependent variable. In sum, these appendix tables only show some slight differences.

Table 3.1: Regression Estimates of Net Total Capital Inflows

VARIABLES	(1.a) -CA (%GDP)	(1.b) -CA (%GDP)	(2.a) ΔNFL (%GDP)	(2.b) ΔNFL (%GDP)
Produced Capital Abundance, 1995	0.702	0.728**	-0.0303	-0.0261
	(0.429)	(0.299)	(0.565)	(0.385)
Net Foreign Assets Abundance, 1995	-2.529***	-2.507***	1.051	1.057*
	(0.844)	(0.565)	(0.835)	(0.580)
Human Capital Abundance, 1995	-0.374*	-0.353**	-0.401**	-0.385***
	(0.215)	(0.149)	(0.167)	(0.116)
Subsoil Resource Abundance, 1995	-2.844***	-2.912***	-0.995	-1.063**
	(0.468)	(0.327)	(0.652)	(0.469)
Non-subsoil Resource Abundance, 1995	0.190	0.201**	0.0600	0.0810
	(0.141)	(0.0972)	(0.191)	(0.132)
KA Openness Chinn-Ito Index, 1995	-1.523	-0.976	-0.359	-0.200
	(1.881)	(1.372)	(1.491)	(1.061)
After the 2008-09 Global Financial Crisis (=1)		0.815		0.0733
		(0.845)		(0.820)
Growth (%), avg.1996-2007		0.432		0.343*
		(0.276)		(0.207)
Growth*GFC (%), avg.2010-2015		-0.366		-0.0329
		(0.230)		(0.246)
Population growth (%), avg. 1996-2015	0.0185	0.00849	-0.123	-0.138
	(0.228)	(0.152)	(0.201)	(0.141)
Institutional Quality ICRG Index, 1996	-18.50***	-19.24***	-7.128	-7.889*
	(6.553)	(4.498)	(5.899)	(4.004)
Financial Development Index, 1995	-0.0472	-0.579	2.427	2.129
	(4.349)	(2.910)	(3.500)	(2.410)
Young Dependency Ratio, avg. 1996-2015	0.0204	0.0200	-0.00595	-0.0122
	(0.0521)	(0.0338)	(0.0507)	(0.0329)
Old Dependency Ratio, avg. 1996-2015	0.296*	0.279***	0.108	0.0915
	(0.149)	(0.0987)	(0.111)	(0.0748)
Real per capita growth (%), avg. 1996-2015	0.115		0.364	
	(0.438)		(0.365)	
Constant	9.678	9.213**	5.821	6.648
	(6.927)	(4.285)	(6.301)	(4.067)
Observations	95	190	95	190
R-squared	0.621	0.632	0.221	0.222

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

3.5 Disaggregated Capital Flows

3.5.1 Private versus Official

The distinction between private and official capital flows is of great importance due to theoretical and empirical considerations. First, many empirical studies find strong evidence that only private capital flows are in accordance with the neoclassical prediction of efficient allocation (Aguiar and Amador 2011; Gourinchas and Jeanne 2013; Alfaro et al. 2014). In addition, Gourinchas and Jeanne (2013) first explain that the decomposition into private and public should not invalidate the behavior of net total capital flows from the standard neoclassical viewpoint because of the Ricardian Equivalence assumption— changes in net public and private borrowing should offset each other in the long run. However, they emphasize that the Ricardian Equivalence fails if there are financial frictions such as capital controls that affect private flows differently from public flows (p. 1504). Consequently, relaxing the assumption of the Ricardian Equivalence could also allow for the possibility of *persistent* twin deficits—imbalances in the government budget and CA. As in equation (3.2), if a country decides to run a budget deficit while individuals do not exactly offset that, the countries must borrow from abroad as captured by a CA deficit. While the lending countries would associate with CA surpluses or net national saving. Furthermore, in a recent study, Lowe et al. (2019) distinguish between the public and private marginal product of capital (MPK) for two reasons. One is that relatively larger investments in developing countries are public, and the other stems from the literature on idiosyncratic behavior between public and private agents. The latter includes explanations not only about efficiency but also redistributive, rent capture, and other policies (p. 337). Finally, the hegemony of the US dollar in the current international monetary and financial system has also allowed the US to recycling CA surpluses of some countries to other CA deficit countries and so to sustain its own growing CA deficits over time (see, e.g., Gourinchas and Rey 2005; Vasudevan 2008). Thus, considering an OLG model with *non-Ricardian equivalence* model allows for the phenomenon of persistent global imbalances.

In this section, therefore, I revisit the hypotheses regarding the allocative allocation and wealth compositions, as in my previous study but with *disaggregated* net capital inflows. I also consider the role of demographic factors. In this study, I motivate and adopt classifications of disaggregated capital flows from the literature as follows. First, Alfaro, et al. (2014) refer to their argument in a previous study (Alfaro et al. 2008) that FDI and portfolio equity flows could be assigned to private-to-private transactions (p. 9). The problem they identify is about assigning debt flows to private or public, based on creditor and debtor sides.[41] Hence, they rely on the World Bank- Global Development and Finance (GDF) dataset and focus on the (debtor) or *liability* side of the balance sheet following Aguiar and Amador (2011) and Gourinchas and Jeanne (2013). However, there is no further detailed information available in the GDF dataset about Public and Publicly Guaranteed (PPG) debt, so they assigned it as public. Non-guaranteed (NG) debt is assigned as private flows. Thus, a critical further step conducted by Alfaro et al. is that they were able to identify PPG debt flows based on the *creditor* side whether they come from private or official lenders. This is an analytical advance compared with Aguiar and Amador (2011) and Gourinchas and Jeanne (2013) who classify all PPG flows as public. It should also be noted that only *non-high income, developing* countries are required to report to the World Bank's GDF, so this will restrict the sample in our analysis.

Therefore, the current study adopts and contrasts three direct measures of disaggregated capital flows. These are illustrated as follows:

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[41] Total debt is defined as the sum of portfolio investment debt and loans from banks. The latter is reported under other investment in the financial account of the balance of payments.

Private Flows = Equity + Private Debt

= (FDI + Portfolio equity investment + Total private debt) / GDP (3.4)

It should be noted that there is also an indirect measure of net private inflows calculated as the residual from the difference between net total capital inflows and *official* inflows. However, there are two competing definitions of the official flows: the so-called *public* flows as in Aguiar and Amador (2011) and Gourinchas and Jeanne (2013), and the so-called *sovereign* flows as in Alfaro et al. (2014). However, the latter definition is a more precise measure for official flows regarding both asset and liability sides of the balance sheet. That is the reason that they call the measure "sovereign-to-sovereign capital flows" (Alfaro et al. 2014, p.16).

Public Debt Flows= *total PPG debt flows – Reserves (+=accumulation, excluding gold)* (3.5)

Sovereign-to-Sovereign Debt Flows = PPG debt *from official creditors* + IMF Credit Use

+ *ODA grants – Reserves (+=accumulation, excluding gold)* (3.6)

In a nutshell, the definition of sovereign flows (as in Alfaro et al. 2014), which is a more precise measure, differs by the exclusion of PPG debt from *private* creditors and the addition of both IMF credit use and ODA aid flows.

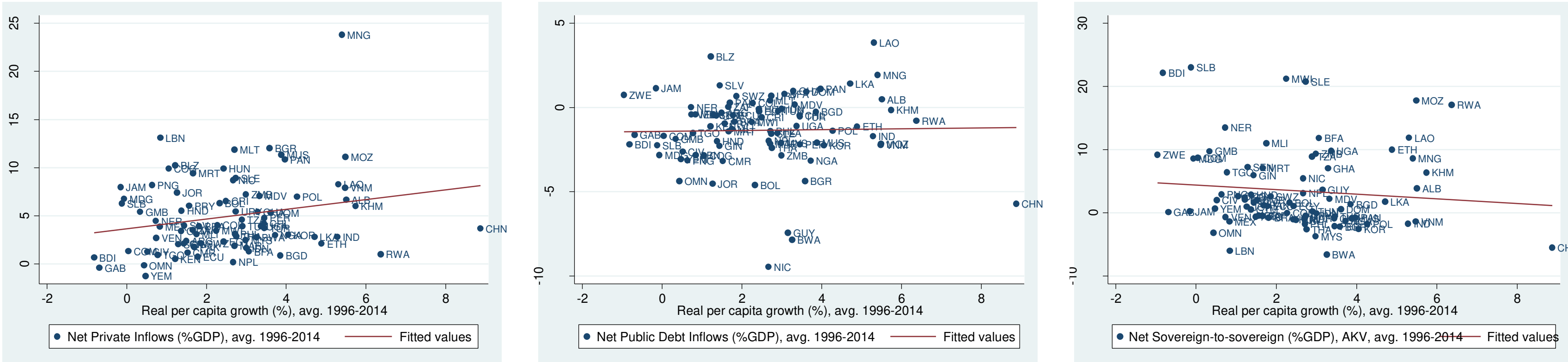
Figure 3.1 illustrates the correlations between the annualized averages of net private, public and sovereign inflows against real per capita growth rates in GDP during 1996-2014. At first glance, it is apparent that the allocative efficiency hypothesis is valid only for private flows. In contrast, the correlation is very weak for public flows and negative for sovereign flows. The latter highlights the importance of including ODA grants and IMF credit while excluding PPG debt from private creditors.

Table 3.2 reports summary statistics of selected variables across regional groups. First, net private inflows were the highest in Europe & Central Asia and then East Asia & Pacific.

Second, the Sub-Saharan African countries were associated with the highest of both ODA aid grants and non-subsoil capital abundance. By contrast, the economies of the Middle East and North Africa were associated with the highest abundance of subsoil capital and foreign reserves accumulation, even though there are also net-oil importers and lower-income countries. As shown, the distinction of subsoil and non-subsoil natural capital abundance is of great importance. Subsoil natural capital comprises fossil fuels, metals, and minerals, while non-subsoil capital includes agricultural land, forests, and protected areas.[42]

Next, Tables 3.3-1 reports the regression estimates using disaggregated capital inflows per investor types, while Table 3.3-2 also considers a structural break due to the 2008-9 GFC.[43] For each type of capital flows, I run two specifications to examine the relevance of the youth and old dependency ratios. Simply put, this is an issue of whether there is omitted relevant variable bias for the case of disaggregated capital flows. If these variables are relevant, it implies that OLGs models are superior to ILA models in predicting disaggregated capital flows. First, regarding the allocative efficiency, results show that only for private flows has some supporting evidence in the pre-crisis period, but the significance disappears with the inclusion of the dependency ratios. In the appendix, Table C3 shows that the *indirect*, residual-based measure of private capital flows are more robust and significant in the pre-crisis period. It should be noted that the indirect measure incorporates valuation effects, unlike the direct measure that relies on the IMF-IFS.[44] Interestingly, these results are in contrast with the findings of Alfaro et al. (2014)

[42] Refer to Table C2 in the appendix for the list of countries.
[43] I should highlight that when I split the whole period into the pre- and post-crisis periods, the number of observations has doubled in the regressions.
[44] Note that I could not investigate the role of valuation effects on a direct measure of private flows because the data on disaggregated capital flows by Alfaro et al. (2014) with valuation adjustments end on 2011. However, in a further disaggregation capital flows we will be able to do so.



a) Private b) Public c) Sovereign

Figure 3.1: Correlations between disaggregated net inflows and real per capita growth, avg.1996-2014

Table 3.2: Regional Group Comparison, selected variables

Region	Private	Public	Sovereign	PPG from Private	IMF credit	Grants	Reserves	Real Growth	$\frac{K_N}{y}$	$\frac{Subsoil}{y}$	$\frac{Non-subsoil}{y}$
	%GDP, averaged (1996-2014)							avg.96-14	1995		
East Asia & Pacific	6.2997	-1.9294	-0.7056	0.5119	0.1124	1.6214	2.8446	3.9867	6.3814	0.5976	5.7838
Europe & Central Asia	7.8541	-1.1790	-0.3575	0.4009	0.1824	1.0158	1.8470	3.8468	2.4737	0.2124	2.2613
Latin America & Caribbean	5.0892	-0.9366	0.2338	0.5590	0.0697	1.6578	1.3274	2.0636	3.2737	0.3385	2.9352
Middle East & North Africa	4.8896	-2.1203	-1.0269	0.6818	0.1088	1.4970	3.1611	1.7174	3.0292	0.8301	2.1991
South Asia	2.0504	-0.0668	0.6385	0.3132	0.0821	0.9364	1.2101	3.8851	3.9114	0.1169	3.7945
Sub-Saharan Africa	3.9353	-1.7485	7.4837	0.1338	0.0912	8.9656	1.2693	2.0597	10.2543	0.6759	9.5784

who concluded that the direct measure of private flows is strongly significant and robust while the indirect residual-based measures are "very fragile" (p. 24). This could be attributed to either the sample period or the inclusion of the wealth composition variables. In addition, the institutional quality index enters with an unexpected negative sign, unlike the case of the direct measure regressions. Nevertheless, institutional quality remains insignificant.

Columns 2 and 3 of Tables 3.3-1 and 3.3-2 show that the measure choice of public versus sovereign produces stark differences in the regression results. Some major changes are in the coefficients of the initial abundance measures of net foreign assets, subsoil and non-subsoil natural capital, and financial system development. First, the precise measure "sovereign-to-sovereign" flows, as defined by Alfaro et al (2014), seem to be in accordance with the global imbalances phenomenon, and with the argument that *subsoil*-abundant countries tend to have net *official* capital outflows on average. Also, the demographic dependency ratios are statistically and economically significant when considering the sovereign-to-sovereign measure rather than the public measure. More importantly, the findings of sovereign flows are consistent with those of total capital flows as reported and discussed in the previous section. Furthermore, the degree of financial system development seems to matter for net sovereign flows. There is a weakly negative association although not robust when including the dependency ratios.

The economic effects of wealth compositions are also significant for sovereign flows. Using the estimates of column 3.b of Table 3.3-1, an increase from the 25^{th} to 75^{th} percentiles in the initial *subsoil* abundance, *ceteris paribus*, associates with a *decrease* of 0.72 percentage points in the subsequent annualized average of net *sovereign* flows to GDP on average. By contrast, the same increase in the initial non-subsoil abundance associates with an increase of 1.39 percentage points in the subsequent annualized average of net sovereign flows to GDP.

Table 3.3-1: Regression results for net private, public, and sovereign inflows

VARIABLES	(1.a) PRIVATE ifs	(1.b) PRIVATE ifs	(2.a) PUBLIC	(2.b) PUBLIC	(3.a) SOVEREIGN	(3.b) SOVEREIGN
Produced Capital Abundance, 1995	0.637	0.494	0.278*	0.289*	0.161	0.380
	(0.421)	(0.316)	(0.140)	(0.149)	(0.256)	(0.303)
Net Foreign Assets Abundance, 1995	-0.317	-0.937	1.116	1.102	-1.696	-1.050
	(1.012)	(0.903)	(0.803)	(0.858)	(1.109)	(1.004)
Human Capital Abundance, 1995	-0.300	-0.234	-0.0621	-0.0369	-0.201	-0.158
	(0.189)	(0.171)	(0.102)	(0.0982)	(0.148)	(0.140)
Subsoil Resource Abundance, 1995	-0.262	-0.344	-0.235	-0.168	-1.849***	-1.434***
	(0.453)	(0.401)	(0.236)	(0.243)	(0.455)	(0.472)
Non-subsoil Resource Abundance, 1995	0.147	0.434**	-0.0354	-0.0121	0.432***	0.212*
	(0.151)	(0.179)	(0.0519)	(0.0679)	(0.0841)	(0.123)
Real per capita growth (%), avg. 1996-2014	0.567*	0.0607	-0.0610	-0.0891	0.0291	0.481
	(0.301)	(0.313)	(0.180)	(0.183)	(0.296)	(0.330)
Population growth (%), avg. 1996-2014	-0.0538	0.126	0.0432	0.0630	0.288	0.174
	(0.283)	(0.257)	(0.144)	(0.153)	(0.327)	(0.340)
KA Openness Chinn-Ito Index, 1995	2.098	2.280	-0.236	0.0136	-0.669	0.303
	(2.167)	(1.901)	(1.003)	(0.919)	(1.845)	(1.718)
Institutional Quality ICRG Index, 1996	9.044	0.406	-1.913	-3.321	-5.746	-2.438
	(6.195)	(5.598)	(3.186)	(3.827)	(5.694)	(6.656)
Financial Development Index, 1995	-0.0755	-3.623	-0.808	-0.317	-8.353*	-1.931
	(3.275)	(3.559)	(2.978)	(3.242)	(4.689)	(4.003)
Young Dependency Ratio, avg. 1996-2014		-0.124**		0.00678		0.175***
		(0.0581)		(0.0300)		(0.0535)
Old Dependency Ratio, avg. 1996-2014		0.181		0.107		0.295**
		(0.156)		(0.118)		(0.129)
Constant	-3.604	7.346	0.588	-0.513	6.163*	-11.70*
	(3.839)	(6.100)	(1.662)	(2.822)	(3.262)	(6.538)
Observations	69	69	69	69	69	69
R-squared	0.259	0.439	0.155	0.178	0.614	0.677

Robust standard errors in parentheses

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

Table 3.3-2: Regression results for net private, public, and sovereign inflows (With a Structural Break due to the 2008-9 GFC)

VARIABLES	(1.a) PRIVATE ifs	(1.b) PRIVATE ifs	(2.a) PUBLIC	(2.b) PUBLIC	(3.a) SOVEREIGN	(3.b) SOVEREIGN
Produced Capital Abundance, 1995	0.674**	0.503**	0.262***	0.274***	0.173	0.398**
	(0.290)	(0.210)	(0.0955)	(0.0999)	(0.168)	(0.200)
Net Foreign Assets Abundance, 1995	-0.284	-0.940	1.114**	1.109*	-1.694**	-1.040
	(0.694)	(0.606)	(0.548)	(0.579)	(0.736)	(0.676)
Human Capital Abundance, 1995	-0.279**	-0.231**	-0.0694	-0.0433	-0.195*	-0.141
	(0.128)	(0.115)	(0.0691)	(0.0667)	(0.103)	(0.0953)
Subsoil Resource Abundance, 1995	-0.274	-0.352	-0.224	-0.144	-1.859***	-1.464***
	(0.315)	(0.280)	(0.158)	(0.159)	(0.311)	(0.314)
Non-subsoil Resource Abundance, 1995	0.148	0.433***	-0.0370	-0.0158	0.434***	0.225***
	(0.105)	(0.122)	(0.0357)	(0.0472)	(0.0590)	(0.0845)
After the 2008-09 Global Financial Crisis (=1)	-0.521	0.0878	-0.278	-0.293	0.258	-0.424
	(0.909)	(0.782)	(0.407)	(0.405)	(0.911)	(0.842)
Growth (%), avg.1996-2007	0.432**	0.0950	-0.128	-0.158	0.0877	0.316
	(0.181)	(0.209)	(0.104)	(0.104)	(0.227)	(0.211)
Growth*GFC (%), avg.2010-2014	0.179	-0.0301	0.0954	0.100	-0.0885	0.145
	(0.263)	(0.229)	(0.110)	(0.112)	(0.240)	(0.241)
Population growth (%), avg. 1996-2014	-0.0491	0.135	0.0265	0.0432	0.302	0.180
	(0.192)	(0.169)	(0.0990)	(0.105)	(0.217)	(0.225)
KA Openness Chinn-Ito Index, 1995	2.204	2.329*	-0.314	-0.0519	-0.613	0.298
	(1.481)	(1.286)	(0.656)	(0.590)	(1.246)	(1.132)
Institutional Quality ICRG Index, 1996	8.473*	0.296	-1.664	-3.051	-5.933	-3.044
	(4.337)	(3.828)	(2.194)	(2.611)	(3.938)	(4.410)
Financial Development Index, 1995	-0.0563	-3.767	-0.676	-0.0234	-8.451***	-2.062
	(2.271)	(2.422)	(2.026)	(2.172)	(3.167)	(2.719)
Young Dependency Ratio, avg. 1996-2014		-0.125***		0.0101		0.168***
		(0.0395)		(0.0203)		(0.0343)
Old Dependency Ratio, avg. 1996-2014		0.177		0.117		0.284***
		(0.107)		(0.0778)		(0.0861)
Constant	-3.254	7.372*	0.741	-0.704	6.026**	-10.59**
	(2.566)	(4.164)	(1.114)	(1.892)	(2.344)	(4.157)
Observations	138	138	138	138	138	138
R-squared	0.257	0.440	0.165	0.192	0.615	0.674

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In the next subsections, I conduct a further disaggregation of net capital inflows per investor types (official and private) and per each type of flows. These include the IMF credit use, official grants, public and publicly guaranteed debt, foreign reserves, FDI, portfolio equity, and other debt flows.

3.5.2 The Decomposition of Official Flows

Since there are stark differences between the measure choices of the official (public versus sovereign) flows, I now attempt to highlight the underlying flow types that drive such differences. First, columns 1-5 of Tables 3.4-1 and 3.4-2 report the regression estimates for the disaggregated official flows and their sum that makes the difference between the definitions of public and sovereign flows. Specifically, I replicate the specification with dependency ratios as in Tables 3.3-1 and 3.3-2 but for more disaggregated *official* capital flows. Findings suggest that the difference in the coefficient on subsoil capital abundance is driven by ODA grants, rather than IMF credit or PPG debt from private creditors. This is apparent by comparing the estimates of columns 1-4 to those of column 5, which captures the components that make the difference. This could be justified by the fact that *subsoil* abundant countries tend to be associated with high-income economies while being net official aid *donors* and less dependent on the use of IMF credit. Conversely, other developing countries with *non-subsoil abundance tend to be* net official aid *recipients.*

Furthermore, column 6 of Table 3.4-1 and 3.4-2 shows that foreign reserves accumulation is driven on average by the abundance of subsoil capital, rather than any other type of capital stock, especially in the pre-crisis period. Moreover, the capital account openness index enters with a significantly positive effect at the 5% level.

Surprisingly, the regression results for ODA grants are puzzling. On the one hand, the annualized averages of net ODA inflows associate positively with initial physical capital abundances although the statistical significance is not robust to regression specifications. This means the significance is only present when considering the structural break specification. On the other, ODA grants and real economic growth are associated positively at the 10% and 5% significance levels for the whole sample and the pre-crisis period, respectively.

Table 3.4-1: Underlying sources of the differences between net public and sovereign inflows

VARIABLES	(1) IMF %GDP	(2) Grants %GDP	(3) IMF+Grants %GDP	(4) PPG from Priv. %GDP	(5) IMF+Grants -PPG.Priv.C %GDP	(6) Reserves %GDP
Produced Capital Abundance, 1995	-0.0250	0.269	0.245	0.178***	0.0676	0.00486
	(0.0227)	(0.221)	(0.232)	(0.0661)	(0.233)	(0.0979)
Net Foreign Assets Abundance, 1995	-0.0516	-1.863*	-1.903*	0.323	-2.227**	0.254
	(0.0310)	(0.949)	(0.959)	(0.206)	(1.033)	(0.495)
Human Capital Abundance, 1995	-0.0135	-0.0976	-0.108	0.0268	-0.135	0.0167
	(0.00860)	(0.124)	(0.123)	(0.0422)	(0.130)	(0.0831)
Subsoil Resource Abundance, 1995	-0.0107	-1.367***	-1.371***	-0.0604	-1.311**	0.200
	(0.0130)	(0.486)	(0.491)	(0.115)	(0.571)	(0.122)
Non-subsoil Resource Abundance, 1995	0.0106	0.213*	0.224*	-0.00924	0.233**	0.0315
	(0.00704)	(0.113)	(0.114)	(0.0197)	(0.114)	(0.0400)
Real per capita growth (%), avg. 1996-2014	-0.00861	0.543*	0.533*	-0.0723	0.605**	0.0605
	(0.00992)	(0.291)	(0.293)	(0.0711)	(0.281)	(0.162)
Population growth (%), avg. 1996-2014	-0.00893	0.0884	0.0816	-0.0539	0.135	-0.0173
	(0.0110)	(0.327)	(0.329)	(0.0780)	(0.335)	(0.153)
KA Openness Chinn-Ito Index, 1995	0.0234	0.984	1.008	1.064*	-0.0569	1.490*
	(0.0858)	(1.507)	(1.530)	(0.603)	(1.814)	(0.884)
Institutional Quality ICRG Index, 1996	0.0131	-1.407	-1.251	-2.371	1.121	1.555
	(0.230)	(5.517)	(5.583)	(1.750)	(5.972)	(3.576)
Financial Development Index, 1995	-0.145	-0.522	-0.600	0.903	-1.503	0.00207
	(0.184)	(2.974)	(2.997)	(1.008)	(3.508)	(2.520)
Young Dependency Ratio, avg. 1996-2014	-0.00225	0.157***	0.156***	-0.00349	0.159***	-0.0262
	(0.00274)	(0.0500)	(0.0507)	(0.0102)	(0.0525)	(0.0168)
Old Dependency Ratio, avg. 1996-2014	0.00354	0.215**	0.225**	0.0560	0.169	-0.0959
	(0.00870)	(0.107)	(0.109)	(0.0460)	(0.124)	(0.0767)
Constant	0.357	-10.23*	-10.11*	0.463	-10.57*	2.267
	(0.331)	(5.776)	(5.869)	(1.568)	(6.009)	(2.594)
Observations	69	69	69	69	69	69
R-squared	0.167	0.695	0.690	0.372	0.699	0.186

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.4-2: Underlying sources of the differences between net public and sovereign inflows (With a Structural Break due to the 2008-9 GFC)

VARIABLES	(1) IMF %GDP	(2) Grants %GDP	(3) IMF+Grants %GDP	(4) PPG from Priv. %GDP	(5) IMF+Grants -PPG.Priv.C %GDP	(6) Reserves %GDP
Produced Capital Abundance, 1995	-0.0262*	0.300**	0.274*	0.169***	0.105	0.0166
	(0.0153)	(0.146)	(0.153)	(0.0432)	(0.156)	(0.0651)
Net Foreign Assets Abundance, 1995	-0.0512**	-1.862***	-1.901***	0.324**	-2.226***	0.245
	(0.0213)	(0.618)	(0.626)	(0.137)	(0.668)	(0.338)
Human Capital Abundance, 1995	-0.0140**	-0.0749	-0.0862	0.0243	-0.110	0.0236
	(0.00566)	(0.0846)	(0.0840)	(0.0280)	(0.0887)	(0.0558)
Subsoil Resource Abundance, 1995	-0.00936	-1.421***	-1.423***	-0.0553	-1.368***	0.171**
	(0.00885)	(0.319)	(0.322)	(0.0787)	(0.374)	(0.0828)
Non-subsoil Resource Abundance, 1995	0.0105**	0.231***	0.242***	-0.00813	0.250***	0.0394
	(0.00477)	(0.0776)	(0.0783)	(0.0143)	(0.0796)	(0.0301)
After the 2008-09 Global Financial Crisis (=1)	-0.0134	-0.110	-0.127	-0.0132	-0.114	0.374
	(0.0346)	(0.772)	(0.777)	(0.275)	(0.846)	(0.432)
Growth (%), avg.1996-2007	-0.0125*	0.444**	0.428**	-0.0898**	0.518***	0.123
	(0.00637)	(0.194)	(0.195)	(0.0422)	(0.181)	(0.0811)
Growth*GFC (%), avg.2010-2014	0.00461	0.0378	0.0435	0.00452	0.0390	-0.128
	(0.00899)	(0.226)	(0.229)	(0.0646)	(0.243)	(0.116)
Population growth (%), avg. 1996-2014	-0.0101	0.113	0.104	-0.0595	0.164	0.00371
	(0.00766)	(0.216)	(0.217)	(0.0502)	(0.222)	(0.101)
KA Openness Chinn-Ito Index, 1995	0.0180	1.028	1.043	1.021**	0.0225	1.522***
	(0.0567)	(0.986)	(1.006)	(0.403)	(1.197)	(0.570)
Institutional Quality ICRG Index, 1996	0.0310	-2.265	-2.088	-2.281*	0.193	1.250
	(0.152)	(3.651)	(3.691)	(1.198)	(3.968)	(2.413)
Financial Development Index, 1995	-0.125	-0.921	-0.974	1.010	-1.983	-0.281
	(0.121)	(2.004)	(2.023)	(0.692)	(2.367)	(1.680)
Young Dependency Ratio, avg. 1996-2014	-0.00207	0.146***	0.145***	-0.00307	0.148***	-0.0309**
	(0.00181)	(0.0313)	(0.0319)	(0.00759)	(0.0333)	(0.0120)
Old Dependency Ratio, avg. 1996-2014	0.00425	0.194***	0.205***	0.0596*	0.145*	-0.107**
	(0.00579)	(0.0706)	(0.0722)	(0.0307)	(0.0815)	(0.0522)
Constant	0.345	-8.924**	-8.808**	0.435	-9.244**	2.581
	(0.217)	(3.615)	(3.687)	(1.083)	(3.786)	(1.734)
Observations	138	138	138	138	138	138
R-squared	0.179	0.694	0.688	0.383	0.699	0.208

Robust standard errors in parentheses

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

3.5.3 The Decomposition of Private Flows

After analyzing the disaggregated *official* capital flows, I now decompose *private* flows into FDI, portfolio equity investment, and total private debt. The latter comprises PPG debt flows from *private* creditors and non-guaranteed (NG) debt flows in the forms of bank loans, portfolio debt, and other debt instruments. An important advantage of this further disaggregation is that the sample size increases due to our lower reliance on the constructed classification of Alfaro et al. (2014). Moreover, I will investigate the role of valuation effects in the current international financial system. [45] In contrast to the IMF- International Financial Statistics (IFS), Lane and Milesi-Ferretti (2017, LM) construct a dataset that incorporates the valuation effects—due to changes in asset prices and exchange rates—so that capital flows data reflect current market exchange rates rather than the historical values.

Tables 3.5-1 and 3.5-2 compare the regression estimates for disaggregated net private *equity* inflows between the IMF-IFS and Lane and Milesi-Ferretti's datasets. First, it could be observed that the determinants from our extended theoretical growth framework explain very little of portfolio flows. Further, they explain relatively little of the observed *valuation-adjusted* net FDI inflows. That is, the R-squared value in column 2b is lower than that of 2a.

In addition, overall findings suggest that the allocative efficiency seems to hold only during the pre-crisis period at best. First, estimates for net total equity inflows, as shown in columns 3.a and 3.b of Table 3.5-2, validate that during the pre-crisis period at the 5% and 10% levels, respectively. Regarding FDI flows, the coefficient on real per capita growth rates enters with opposite signs, indicating the role of valuation effects although results are not strongly statistically significant nor robust to different specifications. On the other hand, there is positive

[45] Although Alfaro et al. (2014) provide data on disaggregated capital flows, data on the valuation-adjusted measure of net total *private* flows ends in 2011.

but insignificant evidence for portfolio equity flows. In sum, while total equity follows, to some extent, the allocative efficiency during the pre-crisis period, results are inconclusive when I distinguish between FDI and portfolio equity flows.

Moreover, the estimates indicate the persistence of global imbalances even for *net total private equity* flows. Simply put, net creditor countries (NFA>0) in 1995 seem to continue investing abroad more than foreigners invested in their home countries. While this finding holds for portfolio and total equity flows, there is an exception for the case of the valuation adjusted FDI flows, as shown in column 2b.

Regarding the important role of financial system development, the regression results are interestingly informative. As one could expect that countries that were able to attract higher *portfolio* flows during the pre-crisis period, as shown in Table 3.5-2, tend to have highly developed financial systems. On the contrary, *FDI* flows are negatively associated with the degree of financial system development. This could be justified by the characteristics of FDI as real rather than financial investments.

Further, while both initial abundance measures of subsoil natural capital and human capital enter negatively, the latter might be puzzling. Also, the statistical significance is present, as shown in columns 3.a and 3.b of Table 3.5-2, when considering a structural break specification. Results indicate that countries with a higher abundance of human capital have associated with net outflows of total equity on average. This could only be justified if we think about the role of global value chains (GVCs) and that the human capital measure captures the cost more than the quality of the labor force. On the other hand, subsoil-abundant countries tend to be classified as high-income economies and to be less attractive for *efficiency*-seeking foreign investors.

Table 3.5-1: Aggregated and disaggregated private equity flows and the role of valuation effects

VARIABLES	1(a) PE (%GDP) ifs	1(b) PE (%GDP) lm	2(a) FDI (%GDP) ifs	2(b) FDI (%GDP) lm	3(a) Total equity (%GDP) ifs	3(b) Total Equity (%GDP) lm
Produced Capital Abundance, 1995	-0.131	-0.0365	0.120	-0.162	-0.0326	-0.199
	(0.180)	(0.238)	(0.181)	(0.243)	(0.247)	(0.242)
Net Foreign Assets Abundance, 1995	-1.001*	-1.507	-0.906	0.153	-1.931**	-1.354*
	(0.598)	(0.913)	(0.669)	(1.011)	(0.782)	(0.690)
Human Capital Abundance, 1995	-0.0908	-0.129	-0.0916	-0.110	-0.187	-0.238**
	(0.0867)	(0.103)	(0.114)	(0.120)	(0.145)	(0.113)
Subsoil Resource Abundance, 1995	0.0103	-0.114	-0.414	-0.229	-0.436	-0.342
	(0.141)	(0.202)	(0.292)	(0.283)	(0.282)	(0.297)
Non-subsoil Resource Abundance, 1995	0.0163	0.0450	0.109	0.0161	0.138	0.0610
	(0.0509)	(0.0797)	(0.117)	(0.124)	(0.126)	(0.0978)
Real per capita growth (%), avg. 1996-2014	0.351	0.444	0.316	-0.0136	0.646	0.431
	(0.370)	(0.395)	(0.228)	(0.225)	(0.435)	(0.355)
Population growth (%), avg. 1996-2014	-0.243***	-0.104	0.131	-0.0216	-0.107	-0.125
	(0.0738)	(0.112)	(0.152)	(0.169)	(0.170)	(0.120)
KA Openness Chinn-Ito Index, 1995	1.496	4.114	-0.348	-3.313	1.100	0.802
	(1.783)	(3.892)	(2.151)	(4.424)	(1.997)	(1.617)
Institutional Quality ICRG Index, 1996	-1.263	-1.434	0.563	3.262	-0.555	1.828
	(7.036)	(8.181)	(4.187)	(6.270)	(7.873)	(6.414)
Financial Development Index, 1995	4.083	4.987	-5.715***	-4.378*	-1.614	0.609
	(2.743)	(3.317)	(2.154)	(2.303)	(3.573)	(2.874)
Young Dependency Ratio, avg. 1996-2014	0.0167	0.0185	-0.0718**	-0.0432	-0.0575	-0.0247
	(0.0249)	(0.0268)	(0.0316)	(0.0289)	(0.0403)	(0.0314)
Old Dependency Ratio, avg. 1996-2014	-0.0529	-0.134	-0.0915	0.0326	-0.146	-0.101
	(0.113)	(0.128)	(0.0779)	(0.0966)	(0.121)	(0.0934)
Constant	-1.871	-3.447	8.164**	6.091*	6.484	2.644
	(5.637)	(5.919)	(3.353)	(3.476)	(6.763)	(5.492)
Observations	93	93	93	93	93	93
R-squared	0.083	0.087	0.277	0.061	0.244	0.135

Robust standard errors in parentheses

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

Table 3.5-2: Aggregated and disaggregated private equity flows and the role of valuation effects (With a Structural Break due to the 2008-9 GFC)

VARIABLES	1(a) PE (%GDP) ifs	1(b) PE (%GDP) lm	2(a) FDI (%GDP) ifs	2(b) FDI (%GDP) lm	3(a) Total Equity (%GDP) ifs	3(b) Total Equity (%GDP) lm
Produced Capital Abundance, 1995	-0.0877	0.0251	0.132	-0.194	0.0224	-0.169
	(0.109)	(0.168)	(0.125)	(0.183)	(0.152)	(0.156)
Net Foreign Assets Abundance, 1995	-1.024**	-1.532**	-0.928**	0.149	-1.975***	-1.383***
	(0.417)	(0.630)	(0.463)	(0.690)	(0.549)	(0.489)
Human Capital Abundance, 1995	-0.0757	-0.110	-0.0811	-0.113	-0.162*	-0.223***
	(0.0578)	(0.0707)	(0.0769)	(0.0840)	(0.0958)	(0.0742)
Subsoil Resource Abundance, 1995	-0.0368	-0.167	-0.457**	-0.233	-0.524**	-0.400*
	(0.107)	(0.158)	(0.209)	(0.190)	(0.217)	(0.224)
Non-subsoil Resource Abundance, 1995	0.0123	0.0345	0.117	0.0312	0.141	0.0658
	(0.0401)	(0.0576)	(0.0806)	(0.0821)	(0.0907)	(0.0690)
After the 2008-09 Global Financial Crisis (=1)	0.175	0.210	-0.0632	-0.198	0.123	0.0121
	(0.513)	(0.760)	(0.526)	(0.781)	(0.689)	(0.589)
Growth (%), avg.1996-2007	0.486	0.648*	0.276*	-0.195	0.746**	0.453*
	(0.306)	(0.357)	(0.166)	(0.259)	(0.322)	(0.269)
Growth*GFC (%), avg.2010-2014	-0.0739	-0.0887	0.0267	0.0836	-0.0519	-0.00512
	(0.0779)	(0.124)	(0.150)	(0.160)	(0.160)	(0.121)
Population growth (%), avg. 1996-2014	-0.224***	-0.0763	0.130	-0.0417	-0.0879	-0.118
	(0.0505)	(0.0703)	(0.103)	(0.108)	(0.117)	(0.0799)
KA Openness Chinn-Ito Index, 1995	1.801	4.556	-0.304	-3.583	1.450	0.972
	(1.345)	(2.864)	(1.564)	(3.248)	(1.485)	(1.230)
Institutional Quality ICRG Index, 1996	-2.049	-2.419	0.00985	3.424	-1.864	1.004
	(4.364)	(5.314)	(2.927)	(4.467)	(4.940)	(4.023)
Financial Development Index, 1995	3.753**	4.554**	-5.884***	-4.236***	-2.104	0.318
	(1.742)	(2.187)	(1.422)	(1.538)	(2.302)	(1.862)
Young Dependency Ratio, avg. 1996-2014	0.0175	0.0215	-0.0758***	-0.0493**	-0.0604**	-0.0278
	(0.0176)	(0.0196)	(0.0217)	(0.0208)	(0.0274)	(0.0214)
Old Dependency Ratio, avg. 1996-2014	-0.0636	-0.146	-0.102*	0.0308	-0.167*	-0.115*
	(0.0814)	(0.0917)	(0.0538)	(0.0676)	(0.0861)	(0.0678)
Constant	-2.007	-3.865	8.762***	6.972***	6.901	3.107
	(3.805)	(4.092)	(2.280)	(2.568)	(4.470)	(3.664)
Observations	186	186	186	186	186	186
R-squared	0.103	0.104	0.277	0.064	0.264	0.144

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

After examining private *equity* flows, I now concentrate on *debt* flows from *private* creditors, defined as the sum of PPG from *private* creditors and non-guaranteed (NG) debt flows.

It should be noted that the sample only covers non-high-income EMDEs due to the caveats of the World Bank database on GDF, as discussed in subsection 5.1.

Tables 3.6-1 and 3.6-2 report the regression estimates, where the latter considers a structural break due to the 2008-9 GFC. First, contrary to the findings of Alfaro et al. (2014), the overall findings show no supporting evidence on the allocative efficiency for net private debt whether in aggregated or disaggregated inflows. Specifically, I find a negatively statistical coefficient for the pre-crisis period, compared with a weak statistical evidence on the allocative efficiency of NG debt flows during the *post*-crisis period at best. Further, column 1 shows that the abundance of physical capital in 1995 is positively associated with the subsequent annualized average of net PPG debt flows from private creditors.

Results also show the importance of institutional quality, especially when considering a structural break as in Table 3.6-2. First, countries with superior institutions tend to be associated with higher net total debt inflows. Second, there is a striking difference between NG and PPG debt flows from private creditors. While the NG debt flows are associated positively, PPG debt flows from private creditors are associated negatively. Both results suggest that countries with superior institutions are more able to secure NG debt flows relative to PPG debt flows. The latter also highlights the role of uncertainties and risks that foreign investors could face, so that their governments with less developed institutions had to guarantee the foreign private creditors for the repayments of their official debts along with the private debts. Otherwise, those private borrowers would be less able to tap international capital markets.

Table 3.6-1: Total and disaggregated debt flows from private creditors

VARIABLES	(1) PPG Debt from Private Creditors %GDP	(2) NG Debt %GDP	(3) Total Private Debt %GDP
Produced Capital Abundance, 1995	0.178***	-0.00590	0.172
	(0.0666)	(0.123)	(0.134)
Net Foreign Assets Abundance, 1995	0.312	-0.220	0.0919
	(0.209)	(0.339)	(0.337)
Human Capital Abundance, 1995	0.0226	-0.155**	-0.133*
	(0.0422)	(0.0710)	(0.0724)
Subsoil Resource Abundance, 1995	-0.0752	-0.0229	-0.0981
	(0.122)	(0.186)	(0.215)
Non-subsoil Resource Abundance, 1995	-0.00994	0.206**	0.196**
	(0.0201)	(0.0778)	(0.0788)
Real per capita growth (%), avg. 1996-2014	-0.0601	-0.106	-0.167
	(0.0748)	(0.112)	(0.129)
Population growth (%), avg. 1996-2014	-0.0570	0.113	0.0555
	(0.0775)	(0.104)	(0.120)
KA Openness Chinn-Ito Index, 1995	1.075*	0.0849	1.160
	(0.597)	(0.589)	(0.859)
Institutional Quality ICRG Index, 1996	-2.282	5.415***	3.132
	(1.757)	(2.026)	(2.536)
Financial Development Index, 1995	0.950	-3.102*	-2.153
	(1.011)	(1.674)	(1.860)
Young Dependency Ratio, avg. 1996-2014	-0.00304	-0.0693***	-0.0723***
	(0.0103)	(0.0249)	(0.0249)
Old Dependency Ratio, avg. 1996-2014	0.0542	-0.00857	0.0456
	(0.0461)	(0.0740)	(0.0797)
Constant	0.382	2.978	3.360
	(1.581)	(2.354)	(2.590)
Observations	68	68	68
R-squared	0.375	0.502	0.510

Robust standard errors in parentheses

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

Table 3.6-2: Total and disaggregated debt flows from private creditors
(With a Structural Break due to the 2008-9 GFC)

VARIABLES	(1) PPG Debt from Private Creditors %GDP	(2) NG Debt %GDP	(3) Total Private Debt %GDP
Produced Capital Abundance, 1995	0.170***	-0.0238	0.147*
	(0.0432)	(0.0811)	(0.0877)
Net Foreign Assets Abundance, 1995	0.315**	-0.203	0.112
	(0.139)	(0.236)	(0.234)
Human Capital Abundance, 1995	0.0214	-0.160***	-0.139***
	(0.0282)	(0.0468)	(0.0475)
Subsoil Resource Abundance, 1995	-0.0683	0.0166	-0.0517
	(0.0839)	(0.118)	(0.136)
Non-subsoil Resource Abundance, 1995	-0.00835	0.201***	0.193***
	(0.0145)	(0.0491)	(0.0489)
After the 2008-09 Global Financial Crisis (=1)	-0.00724	-0.339	-0.346
	(0.277)	(0.232)	(0.363)
Growth (%), avg.1996-2007	-0.0798*	-0.186**	-0.266***
	(0.0448)	(0.0793)	(0.0932)
Growth*GFC (%), avg.2010-2014	0.00248	0.116*	0.118
	(0.0648)	(0.0677)	(0.0934)
Population growth (%), avg. 1996-2014	-0.0612	0.0914	0.0303
	(0.0500)	(0.0660)	(0.0759)
KA Openness Chinn-Ito Index, 1995	1.031**	0.00960	1.041*
	(0.400)	(0.387)	(0.573)
Institutional Quality ICRG Index, 1996	-2.229*	5.695***	3.466**
	(1.199)	(1.329)	(1.715)
Financial Development Index, 1995	1.033	-2.793***	-1.760
	(0.691)	(1.030)	(1.135)
Young Dependency Ratio, avg. 1996-2014	-0.00294	-0.0652***	-0.0682***
	(0.00760)	(0.0157)	(0.0158)
Old Dependency Ratio, avg. 1996-2014	0.0576*	0.00577	0.0634
	(0.0309)	(0.0502)	(0.0520)
Constant	0.394	2.746*	3.139*
	(1.086)	(1.540)	(1.745)
Observations	136	136	136
R-squared	0.384	0.531	0.545

Robust standard errors in parentheses

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

3.6 Discussion and Conclusion

This study utilizes the theoretical insights from OLG models to empirically investigate the patterns of international capital flows during 1995-2015. Relaxing the strong underlying assumptions of the Ricardian Equivalence seems to be of great importance in understanding the saving-investment decisions, and hence, in the external positions. Overall results support the role of cross-country differences in demographic structures and the distinction of aggregated and disaggregated capital flows. This implies the superiority of OLG to ILA models, as OLG models are more general. Thus, findings support the adoption of OLG models with *non-Ricardian equivalence*, especially in analyzing capital flows. Moreover, the extended growth framework with the broad definition of total wealth helps us to better understand the role of economies' heterogeneities in wealth composition and, hence, in driving aggregated and disaggregated capital flows. I demonstrate how the heterogeneities in investor types and in countries' wealth compositions and demographic structures associate with international capital flows.

Some of the main findings are as follows. First, the inclusion of demographic factors is found to be relevant and corrects the bias in the estimates. Second, there is, at best, statistical evidence on the allocative efficiency of total capital flows during the pre-crisis period. Both results highlight the superiority of OLG to the ILA because of the cross-country difference in demographic profiles. Further, my previous findings pertain to initial abundance measures of subsoil capital and NFA positions remain qualitatively unchanged. Also, the disaggregation of capital flows into private and official shows that only the former validates the allocative efficiency in the pre-crisis period at best. Moreover, sovereign-to-sovereign flows are found to be driven by initial abundance measures of subsoil and non-subsoil natural resources. While Subsoil-abundant countries tended to be associated with net official *outflows*, non-subsoil-abundant countries tended to be associated with net official inflows. Specifically, subsoil natural capital seems to be the main determinant of foreign reserve accumulation in the pre-crisis period.

The development of the political and legal institutions, as well as the financial systems, seem to be critical. First, institutional quality seems to matter most in the decomposition of total private debt. Countries with superior institutions tend to be more able to borrow abroad without the need for governments' guarantees. Regarding equity flows, the degree of financial system development enters positively in the case of *portfolio* equity flows, while it enters negatively in the case of *FDI* flows. This highlights the characteristics of these flow types, particularly about financial versus real investment.

Therefore, some policy implications could be drawn based on initial country-specific conditions and types of capital flows. First, pertaining to net total capital inflows, results show that subsoil-abundant countries were able to accumulate foreign assets over time. While this shows, to some extent, that such countries were able to smooth the use of resource windfalls, they still associate with relatively low averaged growth rates. The former means they have been considering intergenerational welfare, and the latter highlights the need for other tradable non-resource sectors, which could induce economy-wide productivity growth. Hence, they should adopt an industrialization strategy by developing a dynamic comparative advantage, particularly through the role of economies of scale and scope (see e.g., Vasudevan 2012). Second, since superior institutional quality allows countries to issue debt liabilities with less need for government guarantees, so policymakers should improve their legal and political institutions.

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Appendix A: Appendix to Chapter 1

Table A1: List of Countries (based on regional groups)

Europe & Central Asia		East Asia & Pacific		Latin America & Caribbean		Sub-Saharan Africa		North America	
ALB	Albania	*AUS*	Australia	*ARG*	Argentina	*BWA*	Botswana	*CAN*	Canada
AUT	Austria	*KHM*	Cambodia	*BLZ*	Belize	*BFA*	Burkina Faso	*USA*	United States
BEL	Belgium	*CHN*	China	*BOL*	Bolivia	*BDI*	Burundi		
BGR	Bulgaria	*IDN*	Indonesia	*BRA*	Brazil	*CMR*	Cameroon		
DNK	Denmark	*JPN*	Japan	*CHL*	Chile	*COM*	Comoros	The Middle East & North Africa	
FIN	Finland	*KOR*	Korea, Rep.	*COL*	Colombia	*COG*	Congo	*BHR*	Bahrain
FRA	France	*LAO*	Lao PDR	*CRI*	Costa Rica	*CIV*	Cote d'Ivoire	*EGY*	Egypt
DEU	Germany	*MYS*	Malaysia	*DOM*	Dominican Republic	*ETH*	Ethiopia	*JOR*	Jordan
GRC	Greece	*MNG*	Mongolia	*ECU*	Ecuador	*GAB*	Gabon	*KWT*	Kuwait
HUN	Hungary	*PNG*	Papua New Guinea	*SLV*	El Salvador	*GMB*	Gambia	*LBN*	Lebanon
IRL	Ireland	*PHL*	Philippines	*GTM*	Guatemala	*GHA*	Ghana	*MLT*	Malta
ITA	Italy	*SGP*	Singapore	*GUY*	Guyana	*GIN*	Guinea	*MAR*	Morocco
NLD	Netherlands	*SLB*	Solomon Islands	*HND*	Honduras	*KEN*	Kenya	*OMN*	Oman
NOR	Norway	*THA*	Thailand	*JAM*	Jamaica	*MDG*	Madagascar	*SAU*	Saudi Arabia
POL	Poland	*VNM*	Vietnam	*MEX*	Mexico	*MWI*	Malawi	*TUN*	Tunisia
PRT	Portugal			*NIC*	Nicaragua	*MLI*	Mali	*YEM*	Yemen, Rep.
ESP	Spain			*PAN*	Panama	*MRT*	Mauritania		
SWE	Sweden			*PRY*	Paraguay	*MUS*	Mauritius	South Asia	
TUR	Turkey			*PER*	Peru	*MOZ*	Mozambique	*BGD*	Bangladesh
GBR	United Kingdom			*SUR*	Suriname	*NAM*	Namibia	*IND*	India
				URY	Uruguay	*NER*	Niger	*MDV*	Maldives
				VEN	Venezuela	*NGA*	Nigeria	*NPL*	Nepal
						RWA	Rwanda	*PAK*	Pakistan
						SEN	Senegal	*LKA*	Sri Lanka
						SLE	Sierra Leone		
						ZAF	South Africa		

SWZ	Swaziland
TZA	Tanzania
TGO	Togo
UGA	Uganda
ZMB	Zambia
ZWE	Zimbabwe

Table A2: List of Countries (based on per capita income groups as of 2014)

High income: OECD		High income: non-OECD		Upper middle income		Lower middle income		Low income	
AUS	Australia	*ARG*	Argentina	*ALB*	Albania	*BGD*	Bangladesh	*BFA*	Burkina Faso
AUT	Austria	*BHR*	Bahrain	*BLZ*	Belize	*BOL*	Bolivia	*BDI*	Burundi
BEL	Belgium	*KWT*	Kuwait	*BWA*	Botswana	*CMR*	Cameroon	*KHM*	Cambodia
CAN	Canada	*MLT*	Malta	*BRA*	Brazil	*COG*	Congo	*COM*	Comoros
CHL	Chile	*OMN*	Oman	*BGR*	Bulgaria	*CIV*	Cote d'Ivoire	*ETH*	Ethiopia
DNK	Denmark	*SAU*	Saudi Arabia	*CHN*	China	*EGY*	Egypt	*GMB*	Gambia
FIN	Finland	*SGP*	Singapore	*COL*	Colombia	*SLV*	El Salvador	*GIN*	Guinea
FRA	France	*URY*	Uruguay	*CRI*	Costa Rica	*GHA*	Ghana	*MDG*	Madagascar
DEU	Germany	*VEN*	Venezuela	*DOM*	Dominican Republic	*GTM*	Guatemala	*MWI*	Malawi
GRC	Greece			*ECU*	Ecuador	*GUY*	Guyana	*MLI*	Mali
HUN	Hungary			*GAB*	Gabon	*HND*	Honduras	*MOZ*	Mozambique
IRL	Ireland			*JAM*	Jamaica	*IND*	India	*NPL*	Nepal
ITA	Italy			*JOR*	Jordan	*IDN*	Indonesia	*NER*	Niger
JPN	Japan			*LBN*	Lebanon	*KEN*	Kenya	*RWA*	Rwanda
KOR	Korea, Rep.			*MYS*	Malaysia	*LAO*	Lao PDR	*SLE*	Sierra Leone
NLD	Netherlands			*MDV*	Maldives	*MRT*	Mauritania	*TZA*	Tanzania
NOR	Norway			*MUS*	Mauritius	*MAR*	Morocco	*TGO*	Togo
POL	Poland			*MEX*	Mexico	*NIC*	Nicaragua	*UGA*	Uganda
PRT	Portugal			*MNG*	Mongolia	*NGA*	Nigeria	*ZWE*	Zimbabwe
ESP	Spain			*NAM*	Namibia	*PAK*	Pakistan		
SWE	Sweden			*PAN*	Panama	*PNG*	Papua New Guinea		
GBR	United Kingdom			*PRY*	Paraguay	*PHL*	Philippines		
USA	United States			*PER*	Peru	*SEN*	Senegal		
				ZAF	South Africa	*SLB*	Solomon Islands		
				SUR	Suriname	*LKA*	Sri Lanka		
				THA	Thailand	*SWZ*	Swaziland		
				TUN	Tunisia	*VNM*	Vietnam		
				TUR	Turkey	*YEM*	Yemen		
						ZMB	Zambia		

Table A3: Pair-wise Correlation Matrix

	g_y	g_n	k_p/y	K_f/y	k_h/y	Subsoil/y	Non-subsoil/y	KA openness	FD	IQ
g_y	1.0000									
g_n	-0.1805	1.0000								
k_p/y	-0.0569	-0.0804	1.0000							
K_f/y	-0.0388	0.0604	-0.2720	1.0000						
k_h/y	0.0544	-0.2547	-0.0041	0.0305	1.0000					
Subsoil/y	-0.1896	0.1823	0.0682	-0.0105	-0.2697	1.0000				
Non-subsoil/y	0.2219	0.2505	0.3178	-0.4784	-0.0604	0.1000	1.0000			
KA openness	-0.2397	0.0276	-0.1274	0.3903	0.1535	-0.0686	-0.5310	1.0000		
FD	-0.0618	-0.3975	-0.0504	0.4501	0.4037	-0.1517	-0.6022	0.6124	1.0000	
IQ	-0.0820	-0.4178	-0.0139	0.3933	0.3750	-0.1999	-0.5510	0.4972	0.8677	1.0000

Table A5-1: Regression Estimates without Controlling for KN

	(1)	(2)	(3)
VARIABLES	-CA (%GDP)	ΔNFL (%GDP)	-CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.341	-0.0860	0.783
	(0.444)	(0.469)	(0.640)
Net Foreign Assets Abundance, 1995	-3.627***	0.831	-6.412***
	(1.278)	(0.914)	(1.731)
Human Capital Abundance, 1995	-0.0776	-0.236*	0.109
	(0.256)	(0.121)	(0.342)
KA Openness Chinn-Ito Index, 1995	-5.103**	-0.0884	-8.285***
	(2.289)	(1.186)	(2.899)
Real per capita growth (%), avg. 1996-2015	0.0719	0.330	0.324
	(0.470)	(0.266)	(0.671)
Population growth (%), avg. 1996-2015	0.151	-0.192	0.945**
	(0.235)	(0.192)	(0.361)
Constant	2.356	1.587	0.432
	(3.250)	(2.085)	(4.461)
Observations	108	108	108
R-squared	0.289	0.074	0.414

Robust standard errors in parentheses

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

Table A5-2 Regression Estimates after Controlling for Aggregated KN

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.404	-0.0654	0.559
	(0.490)	(0.476)	(0.661)
Net Foreign Assets Abundance, 1995	-3.785**	0.780	-5.858***
	(1.442)	(1.070)	(1.911)
Human Capital Abundance, 1995	-0.0721	-0.234*	0.0894
	(0.260)	(0.124)	(0.332)
Natural Capital Abundance, 1995	-0.0830	-0.0270	0.292
	(0.186)	(0.126)	(0.281)
KA Openness Chinn-Ito Index, 1995	-5.623**	-0.257	-6.459**
	(2.228)	(1.402)	(2.686)
Real per capita growth (%), avg. 1996-2015	0.112	0.342	0.184
	(0.495)	(0.288)	(0.672)
Population growth (%), avg. 1996-2015	0.211	-0.172	0.737**
	(0.219)	(0.169)	(0.347)
Constant	2.471	1.624	0.0273
	(3.250)	(2.080)	(4.269)
Observations	108	108	108
R-squared	0.291	0.075	0.424

Robust standard errors in parentheses

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

Table A6-1: (Disaggregated KN and composite indexes for IQ and FD)

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.874	0.0471	1.177
	(0.576)	(0.577)	(0.749)
Net Foreign Assets Abundance, 1995	-3.379**	0.819	-5.232***
	(1.442)	(1.098)	(1.909)
Human Capital Abundance, 1995	-0.101	-0.320**	0.0136
	(0.214)	(0.130)	(0.256)
Natural Capital Abundance, 1995	-0.202	-0.0951	0.107
	(0.214)	(0.146)	(0.315)
KA Openness Chinn-Ito Index, 1995	-0.967	-0.0951	0.696
	(2.384)	(1.444)	(2.958)
Real per capita growth (%), avg. 1996-2015	0.497	0.530	0.756
	(0.483)	(0.334)	(0.649)
Population growth (%), avg. 1996-2015	-0.297	-0.255	-0.0215
	(0.309)	(0.255)	(0.425)
Institutional Quality ICRG Index, 1996	-12.99	-4.693	-13.83
	(7.874)	(5.259)	(9.414)
Financial Development Index, 1995	-1.347	2.417	-5.265
	(5.070)	(3.098)	(7.472)
Constant	7.561	4.088	5.711
	(5.042)	(3.935)	(5.853)
Observations	95	95	95
R-squared	0.374	0.132	0.493

Robust standard errors in parentheses

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

Table A6-2: (Disaggregated KN and single indicators for IQ and FD)

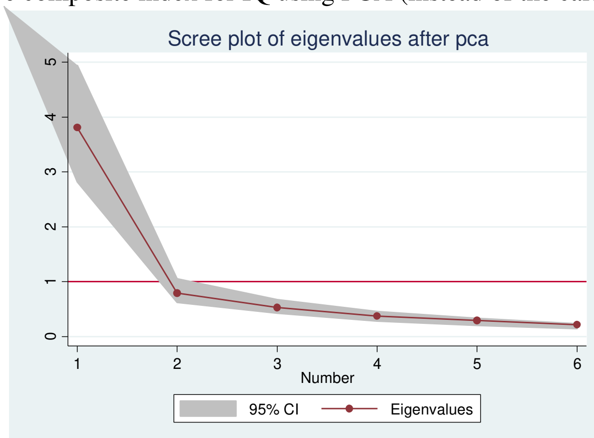
VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.413	-0.0635	0.522
	(0.417)	(0.466)	(0.555)
Net Foreign Assets Abundance, 1995	-2.510***	1.177	-4.238***
	(0.943)	(0.861)	(1.432)
Human Capital Abundance, 1995	-0.322	-0.347**	-0.238
	(0.256)	(0.146)	(0.305)
Subsoil Resource Abundance, 1995	-3.223***	-0.998	-4.121***
	(0.473)	(0.709)	(0.629)
Non-subsoil Resource Abundance, 1995	0.217**	0.0901	0.693***
	(0.0962)	(0.122)	(0.144)
KA Openness Chinn-Ito Index, 1995	-2.489	0.600	-2.638
	(2.446)	(1.427)	(3.335)
Real per capita growth (%), avg. 1996-2015	-0.424	0.130	-0.503
	(0.416)	(0.259)	(0.568)
Population growth (%), avg. 1996-2015	-0.0563	-0.254	0.424
	(0.213)	(0.191)	(0.354)
Rule of Law, 1996	-0.964	-0.693	-0.267
	(1.302)	(0.697)	(1.935)
Private Credit by Banks (%GDP), 1995	-0.0156	0.0111	-0.0441
	(0.0242)	(0.0143)	(0.0318)
Constant	6.310**	2.410	6.443
	(3.006)	(2.108)	(4.378)
Observations	108	108	108
R-squared	0.524	0.147	0.626

Robust standard errors in parentheses

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

Table A6-3: Principle Component Analysis

To create an alternative composite index for IQ using PCA (instead of the calculated weighted index)



VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.701*	-0.0114	0.938*
	(0.413)	(0.550)	(0.494)
Net Foreign Assets Abundance, 1995	-2.549***	1.098	-4.117***
	(0.877)	(0.913)	(1.325)
Human Capital Abundance, 1995	-0.471**	-0.444***	-0.491*
	(0.213)	(0.161)	(0.256)
Subsoil Resource Abundance, 1995	-3.144***	-1.083	-3.905***
	(0.374)	(0.691)	(0.526)
Non-subsoil Resource Abundance, 1995	0.207**	0.0423	0.663***
	(0.0995)	(0.135)	(0.134)
KA Openness Chinn-Ito Index, 1995	-0.550	0.0492	1.215
	(1.835)	(1.328)	(2.301)
Real per capita growth (%), avg. 1996-2015	-0.0168	0.358	0.0479
	(0.357)	(0.285)	(0.505)
Population growth (%), avg. 1996-2015	-0.247	-0.238	0.0506
	(0.227)	(0.218)	(0.359)
Institutional Quality in 1996, PC1	-1.070**	-0.378	-1.150**
	(0.449)	(0.371)	(0.556)
Financial Development Index, 1995	1.291	3.253	-1.609
	(4.016)	(3.346)	(5.414)
Constant	3.108	2.395	2.142
	(2.909)	(2.378)	(3.486)
Observations	95	95	95
R-squared	0.596	0.208	0.683

Robust standard errors in parentheses

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

Table A6-4: one-by-one inclusion (IQ case)

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.469	-0.0766	0.666
	(0.422)	(0.525)	(0.500)
Net Foreign Assets Abundance, 1995	-2.378**	1.267	-4.040***
	(0.904)	(0.873)	(1.330)
Human Capital Abundance, 1995	-0.226	-0.330**	-0.250
	(0.267)	(0.149)	(0.311)
Subsoil Resource Abundance, 1995	-2.997***	-1.023	-3.751***
	(0.418)	(0.703)	(0.575)
Non-subsoil Resource Abundance, 1995	0.205*	0.0269	0.676***
	(0.106)	(0.138)	(0.144)
KA Openness Chinn-Ito Index, 1995	-2.097	0.00177	-1.009
	(2.308)	(1.311)	(2.646)
Real per capita growth (%), avg. 1996-2015	-0.408	0.248	-0.413
	(0.476)	(0.286)	(0.616)
Population growth (%), avg. 1996-2015	-0.288	-0.282	0.0336
	(0.218)	(0.230)	(0.336)
Institutional Quality ICRG Index, 1996	-13.11**	-2.095	-16.96***
	(5.209)	(3.934)	(5.938)
Constant	12.82***	4.719	13.88***
	(4.481)	(3.763)	(5.112)
Observations	96	96	96
R-squared	0.541	0.180	0.646

Robust standard errors in parentheses

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

Table A6-5: one-by-one inclusion (FD case)

VARIABLES	(1) -CA (%GDP)	(2) ΔNFL (%GDP)	(3) -CA+ODA (%GDP)
Produced Capital Abundance, 1995	0.646	-0.0586	0.852*
	(0.391)	(0.490)	(0.504)
Net Foreign Assets Abundance, 1995	-2.574***	0.872	-3.968***
	(0.895)	(0.899)	(1.354)
Human Capital Abundance, 1995	-0.457**	-0.444***	-0.339
	(0.210)	(0.147)	(0.278)
Subsoil Resource Abundance, 1995	-3.328***	-1.056	-4.208***
	(0.445)	(0.698)	(0.573)
Non-subsoil Resource Abundance, 1995	0.196**	0.109	0.656***
	(0.0901)	(0.122)	(0.135)
KA Openness Chinn-Ito Index, 1995	-1.239	-0.0633	-0.109
	(1.877)	(1.308)	(2.336)
Real per capita growth (%), avg. 1996-2015	-0.133	0.244	-0.248
	(0.325)	(0.250)	(0.521)
Population growth (%), avg. 1996-2015	-0.0243	-0.144	0.339
	(0.198)	(0.163)	(0.331)
Financial Development Index, 1995	-5.954*	2.167	-10.74**
	(3.256)	(2.459)	(4.150)
Constant	6.262**	2.546	5.899
	(2.771)	(2.218)	(3.737)
Observations	107	107	107
R-squared	0.572	0.164	0.657

Robust standard errors in parentheses

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

Table A11: Identified Potential Influential Observations

(DFBETA values greater than $\left|\mathbf{2}/\sqrt{\boldsymbol{N}}\right|$)

	- CA	ΔNFL	- CA + ODA
1	Spain	Dominican Republic	Paraguay
2	Poland	Spain	Malawi
3	Sierra Leone	China	China
4	Bahrain	Singapore	Singapore
5	China	Gambia	Malta
6	Singapore	United States	Tanzania
7	Malta	Turkey	Nigeria
8	Saudi Arabia	Norway	Gabon
9	Gabon	Tanzania,	United States
10	Canada	Nicaragua	Turkey
11	Turkey	Yemen	Canada
12	United States	Suriname	Nicaragua
13	Thailand	Kuwait	Botswana
14	Congo	Greece	Suriname
15	Nicaragua	Lebanon	Saudi Arabia
16	Botswana	Papua New Guinea	Sierra Leone
17	Suriname	Bahrain	Bahrain
18	Kuwait	Jamaica	Zambia
19	Jamaica	Nigeria	Lebanon
20	Mongolia	Ireland	Guinea
21	Guinea	Congo (Brazzaville)	Mozambique
22	Mozambique	Mongolia	Cote d'Ivoire
23	Zambia	Zambia	
24	Lebanon		
25	Cote d'Ivoire		

Appendix B: Appendix to Chapter 2

Table B1: Wealth composition across country groups, 2014

Type of asset	Low-income countries (%)	Lower-middle-income countries (%)	Upper-middle-income countries (%)	High-income Non-OECD countries (%)	High-income OECD countries (%)	World (%)
Produced capital	14	25	25	22	28	27
Natural capital	47	27	17	30	3	9
Human capital	41	51	58	42	70	64
Net foreign assets	-2	-3	0	5	-1	0
Total wealth	100	100	100	100	100	100
Total wealth, US$ billion	$7,161	$70,718	$247,793	$76,179	$741,398	$1,143,249
Total wealth per capita	$13,629	$25,948	$112,798	$264,998	$708,389	$168,580

Source: Lange, Wodon, and Carey (2018, p. 8) [In constant 2014 US$]

Table B2. Correlations

	- CA	ΔNFL	gn	kp95	kf95	kh95	kn95	Subsoil	Non-subsoil	KAO	FD	IQ
- CA, avg	1.00											
ΔNFL, avg	0.41	1.00										
gn, avg	-0.07	-0.14	1.00									
Kp 95	0.28	-0.05	-0.12	1.00								
Kf 95	-0.52	0.18	0.08	-0.28	1.00							
Kh 95	-0.12	-0.11	-0.29	-0.04	0.03	1.00						
Kn 95	0.31	-0.13	0.22	0.36	-0.48	-0.22	1.00					
Subsoil 95	-0.41	-0.28	0.24	0.06	0.00	-0.32	0.36	1.00				
Non-subsoil 95	0.43	-0.08	0.18	0.37	-0.51	-0.15	0.98	0.14	1.00			
KAO, 95	-0.35	0.00	0.07	-0.14	0.39	0.22	-0.53	-0.08	-0.54	1.00		
FD, 95	-0.40	0.09	-0.38	-0.08	0.47	0.44	-0.62	-0.20	-0.61	0.60	1.00	
IQ, 95	-0.39	0.05	-0.42	-0.02	0.39	0.39	-0.57	-0.20	-0.55	0.50	0.87	1.00

Note: the correlations in the shaded area are related to the global saving glut hypothesis as discussed in subsection 2.4.3.

Table B3. List of countries, ordered by FD index and NFA/GDP, 1995

	Country Name	*Income Group*	*Regional group*	*FD*	*NFA/Y*
1	United Kingdom	High income: OECD	Europe & Central Asia	0.8690	-0.0228
2	United States	High income: OECD	North America	0.8618	-0.0494
3	Spain	High income: OECD	Europe & Central Asia	0.8416	-0.1839
4	Australia	High income: OECD	East Asia & Pacific	0.8392	-0.5537
5	Canada	High income: OECD	North America	0.8050	-0.4154
6	Netherlands[(b)]	High income: OECD	Europe & Central Asia	0.7870	0.1134
7	Ireland	High income: OECD	Europe & Central Asia	0.7763	-0.3545
8	Korea	High income: OECD	East Asia & Pacific	0.7688	-0.0777
9	Japan[(b)]	High income: OECD	East Asia & Pacific	0.7588	0.1495
10	Germany[(b)]	High income: OECD	Europe & Central Asia	0.7458	0.0493
11	Italy	High income: OECD	Europe & Central Asia	0.7391	-0.0871
12	Sweden	High income: OECD	Europe & Central Asia	0.7217	-0.3744
13	Denmark	High income: OECD	Europe & Central Asia	0.7158	-0.2648
14	France	High income: OECD	Europe & Central Asia	0.7118	-0.0426
15	Singapore[(b)]	High income: non-OECD	East Asia & Pacific	0.7045	0.6303
16	Norway[(b)]	High income: OECD	Europe & Central Asia	0.6695	0.0350
17	Austria	High income: OECD	Europe & Central Asia	0.6645	-0.1531
18	Portugal	High income: OECD	Europe & Central Asia	0.6557	-0.1617
19	Belgium[(b)]	High income: OECD	Europe & Central Asia	0.6471	0.1384
20	Finland	High income: OECD	Europe & Central Asia	0.6105	-0.4073
21	Malaysia	Upper middle income	East Asia & Pacific	0.6082	-0.4584
22	Greece	High income: OECD	Europe & Central Asia	0.5535	-0.1152
23	Brazil	Upper middle income	Latin America & Caribbean	0.5529	-0.1438
24	Malta [(a,b)]	High income: non-OECD	Middle East & North Africa	0.5458	0.3155
25	South Africa	Upper middle income	Sub-Saharan Africa	0.5281	-0.1713
26	Thailand	Upper middle income	East Asia & Pacific	0.5227	-0.5366
27	China	Upper middle income	East Asia & Pacific	0.4661	-0.0848
28	Chile	High income: OECD	Latin America & Caribbean	0.4641	-0.3273
29	Hungary	High income: OECD	Europe & Central Asia	0.4593	-0.5530
30	Jordan	Upper middle income	Middle East & North Africa	0.4352	-0.7655
31	Turkey	Upper middle income	Europe & Central Asia	0.4312	-0.3269
32	Poland	High income: OECD	Europe & Central Asia	0.4101	-0.2073
33	Saudi Arabia	High income: non-OECD	Middle East & North Africa	0.4051	0.8765
34	Kuwait	High income: non-OECD	Middle East & North Africa	0.3985	1.7766
35	India	Lower middle income	South Asia	0.3900	-0.2316
36	Philippines	Lower middle income	East Asia & Pacific	0.3500	-0.4763
37	Mexico	Upper middle income	Latin America & Caribbean	0.3417	-0.4644
38	Morocco	Lower middle income	Middle East & North Africa	0.3304	-0.4569
39	Argentina	High income: non-OECD	Latin America & Caribbean	0.3223	-0.1841
40	Indonesia	Lower middle income	East Asia & Pacific	0.3198	-0.6360
41	Bahrain	High income: non-OECD	Middle East & North Africa	0.3182	0.9861
42	Oman	High income: non-OECD	Middle East & North Africa	0.3155	-0.0662
43	Panama	Upper middle income	Latin America & Caribbean	0.3122	-0.6237
44	Lebanon	Upper middle income	Middle East & North Africa	0.3030	-0.0353
45	Bulgaria	Upper middle income	Europe & Central Asia	0.3020	-0.3727

	Country Name	*Income Group*	*Regional group*	*FD*	*NFA/Y*
46	Colombia	Upper middle income	Latin America & Caribbean	0.3010	-0.1943
47	Peru	Upper middle income	Latin America & Caribbean	0.2892	-0.5184
48	Egypt	Lower middle income	Middle East & North Africa	0.2772	-0.0752
49	Pakistan	Lower middle income	South Asia	0.2735	-0.4792
50	Namibia	Upper middle income	Sub-Saharan Africa	0.2718	0.0321
51	Sri Lanka	Lower middle income	South Asia	0.2444	-0.4325
52	Jamaica	Upper middle income	Latin America & Caribbean	0.2365	-0.7356
53	Mongolia	Upper middle income	East Asia & Pacific	0.2317	-0.2692
54	Vietnam	Lower middle income	East Asia & Pacific	0.2147	-0.7445
55	Bangladesh	Lower middle income	South Asia	0.2145	-0.3892
56	Costa Rica	Upper middle income	Latin America & Caribbean	0.2134	-0.2115
57	Tunisia	Upper middle income	Middle East & North Africa	0.2082	-1.1450
58	El Salvador	Lower middle income	Latin America & Caribbean	0.2037	-0.1744
59	Venezuela	High income: non-OECD	Latin America & Caribbean	0.1902	-0.0443
60	Botswana	Upper middle income	Sub-Saharan Africa	0.1882	0.7665
61	Guatemala	Lower middle income	Latin America & Caribbean	0.1814	-0.1442
62	Uruguay	High income: non-OECD	Latin America & Caribbean	0.1751	-0.1856
63	Honduras	Lower middle income	Latin America & Caribbean	0.1746	-1.2672
64	Ecuador	Upper middle income	Latin America & Caribbean	0.1664	-0.5907
65	Guyana	Lower middle income	Latin America & Caribbean	0.1601	-3.4205
66	Bolivia	Lower middle income	Latin America & Caribbean	0.1599	-0.6966
67	Albania	Upper middle income	Europe & Central Asia	0.1548	-0.0398
68	Papua New Guinea	Lower middle income	East Asia & Pacific	0.1526	-0.4598
69	Cote d'Ivoire	Lower middle income	Sub-Saharan Africa	0.1514	-2.0787
70	Kenya	Lower middle income	Sub-Saharan Africa	0.1469	-0.6985
71	Suriname	Upper middle income	Latin America & Caribbean	0.1441	0.1904
72	Dominican Republic	Upper middle income	Latin America & Caribbean	0.1346	-0.2676
73	Nigeria	Lower middle income	Sub-Saharan Africa	0.1225	-1.2846
74	Ethiopia	Low income	Sub-Saharan Africa	0.1125	-1.0154
75	Paraguay	Upper middle income	Latin America & Caribbean	0.1117	-1.3764
76	Nicaragua	Lower middle income	Latin America & Caribbean	0.1107	-2.5954
77	Ghana	Lower middle income	Sub-Saharan Africa	0.1054	-0.6764
78	Yemen	Lower middle income	Middle East & North Africa	0.1033	-2.3946
79	Senegal	Lower middle income	Sub-Saharan Africa	0.1014	-0.7044
80	Gabon	Upper middle income	Sub-Saharan Africa	0.1008	-0.7445
81	Togo	Low income	Sub-Saharan Africa	0.0996	-1.1232
82	Mali	Low income	Sub-Saharan Africa	0.0933	-0.9256
83	Tanzania	Low income	Sub-Saharan Africa	0.0923	-1.5383
84	Mozambique	Low income	Sub-Saharan Africa	0.0905	-2.0944
85	Burkina Faso	Low income	Sub-Saharan Africa	0.0852	-0.2614
86	Zambia	Lower middle income	Sub-Saharan Africa	0.0834	-2.4640
87	Uganda	Low income	Sub-Saharan Africa	0.0831	-0.4990
88	Madagascar	Low income	Sub-Saharan Africa	0.0831	-1.2197
89	Gambia	Low income	Sub-Saharan Africa	0.0826	-0.3744
90	Cameroon	Lower middle income	Sub-Saharan Africa	0.0819	-0.9191
91	Malawi	Low income	Sub-Saharan Africa	0.0764	-1.6254
92	Niger	Low income	Sub-Saharan Africa	0.0717	-0.7082

	Country Name	*Income Group*	*Regional group*	*FD*	*NFA/Y*
93	Guinea	Low income	Sub-Saharan Africa	0.0678	-0.6740
94	Congo	Lower middle income	Sub-Saharan Africa	0.0543	-3.2252
95	Sierra Leone	Low income	Sub-Saharan Africa	0.0530	-1.3478

Note:

(a) Malta is identified at the 75th percentile value of the financial system development index, which is the threshold set for highly developed financial systems.

(b) These countries are net external creditors, rather than debtors, but have highly developed financial systems.

Appendix C: Appendix to Chapter 3

Table C1.1:

1.a) Without a structural break: Total vs Young and Old Dependency Ratios

VARIABLES	(1.a) -CA (%GDP)	(1.b) ΔNFL (%GDP)	(2.a) -CA (%GDP)	(2.b) ΔNFL (%GDP)	(3.a) -CA (%GDP)	(3.b) ΔNFL (%GDP)	(4.a) -CA (%GDP)	(4.b) ΔNFL (%GDP)
Produced Capital Abundance, 1995	1.068	0.101	0.734	-0.0172	0.990	0.0697	0.702	-0.0303
	(0.684)	(0.633)	(0.452)	(0.574)	(0.654)	(0.616)	(0.429)	(0.565)
Net Foreign Assets Abundance, 1995	-2.540*	1.050	-2.488***	1.068	-2.594**	1.029	-2.529***	1.051
	(1.295)	(0.828)	(0.866)	(0.836)	(1.219)	(0.824)	(0.844)	(0.835)
Human Capital Abundance, 1995	-0.213	-0.351**	-0.476**	-0.443***	-0.0909	-0.303**	-0.374*	-0.401**
	(0.213)	(0.133)	(0.210)	(0.160)	(0.215)	(0.140)	(0.215)	(0.167)
Subsoil Resource Abundance, 1995			-3.094***	-1.099			-2.844***	-0.995
			(0.414)	(0.683)			(0.468)	(0.652)
Non-subsoil Resource Abundance, 1995			0.158	0.0468			0.190	0.0600
			(0.144)	(0.190)			(0.141)	(0.191)
KA Openness Chinn-Ito Index, 1995	-0.748	-0.0349	-0.702	-0.0185	-1.929	-0.500	-1.523	-0.359
	(2.343)	(1.427)	(1.795)	(1.340)	(2.343)	(1.554)	(1.881)	(1.491)
Real per capita growth (%), avg. 1996-2015	0.952*	0.655	0.0464	0.336	0.963*	0.659	0.115	0.364
	(0.526)	(0.431)	(0.437)	(0.370)	(0.508)	(0.429)	(0.438)	(0.365)
Population growth (%), avg. 1996-2015	-0.359	-0.272	-0.248	-0.233	0.0369	-0.116	0.0185	-0.123
	(0.320)	(0.277)	(0.223)	(0.218)	(0.312)	(0.237)	(0.228)	(0.201)
Institutional Quality ICRG Index, 1996	-10.53	-4.013	-13.57**	-5.085	-17.95**	-6.935	-18.50***	-7.128
	(7.933)	(4.964)	(6.186)	(4.841)	(8.363)	(6.170)	(6.553)	(5.899)
Financial Development Index, 1995	2.574	3.497	2.323	3.409	-0.873	2.140	-0.0472	2.427
	(4.985)	(3.644)	(4.178)	(3.598)	(5.144)	(3.489)	(4.349)	(3.500)
Total Dependency Ratio, avg. 1996-2015	0.166***	0.0456	0.0278	-0.00288				
	(0.0596)	(0.0611)	(0.0541)	(0.0510)				
Natural Capital Abundance, 1995	-0.401*	-0.150			-0.301	-0.111		
	(0.233)	(0.205)			(0.254)	(0.194)		
Young Dependency Ratio, avg. 1996-2015					0.142**	0.0362	0.0204	-0.00595

					(0.0564)	(0.0585)	(0.0521)	(0.0507)
Old Dependency Ratio, avg. 1996-2015					0.539***	0.193	0.296*	0.108
					(0.149)	(0.127)	(0.149)	(0.111)
Constant	-5.380	0.521	9.740	5.847	-4.006	1.062	9.678	5.821
	(7.438)	(6.034)	(6.992)	(6.285)	(7.286)	(6.071)	(6.927)	(6.301)
Observations	95	95	95	95	95	95	95	95
R-squared	0.428	0.145	0.598	0.209	0.478	0.168	0.621	0.221

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Notes: At best, there is weak evidence of the allocative efficiency at the 10% significance level (only when considering (-CA) and Aggregated natural capital). Moreover, the 1st paper findings remain qualitatively unchanged.

Table C1.2:

1.b) With a structural break: Total vs Young and Old Dependency Ratios

	(1.a)	(1.b)	(2.a)	(2.b)	(3.a)	(3.b)	(4.a)	(4.b)
VARIABLES	-CA (%GDP)	ΔNFL (%GDP)	-CA (%GDP)	ΔNFL (%GDP)	-CA (%GDP)	ΔNFL (%GDP)	-CA (%GDP)	ΔNFL (%GDP)
Produced Capital Abundance, 1995	1.096**	0.111	0.764**	-0.0118	1.014**	0.0789	0.728**	-0.0261
	(0.474)	(0.434)	(0.316)	(0.391)	(0.453)	(0.422)	(0.299)	(0.385)
Net Foreign Assets Abundance, 1995	-2.538***	1.047*	-2.466***	1.073*	-2.593***	1.025*	-2.507***	1.057*
	(0.906)	(0.590)	(0.580)	(0.581)	(0.853)	(0.586)	(0.565)	(0.580)
Human Capital Abundance, 1995	-0.149	-0.313***	-0.449***	-0.423***	-0.0336	-0.268***	-0.353**	-0.385***
	(0.147)	(0.0934)	(0.147)	(0.113)	(0.147)	(0.0966)	(0.149)	(0.116)
Subsoil Resource Abundance, 1995			-3.141***	-1.155**			-2.912***	-1.063**
			(0.290)	(0.487)			(0.327)	(0.469)
Non-subsoil Resource Abundance, 1995			0.167*	0.0674			0.201**	0.0810
			(0.0997)	(0.132)			(0.0972)	(0.132)
KA Openness Chinn-Ito Index, 1995	-0.485	0.00815	-0.122	0.142	-1.720	-0.474	-0.976	-0.200
	(1.627)	(1.025)	(1.298)	(0.942)	(1.659)	(1.147)	(1.372)	(1.061)
After the 2008-09 Global Financial Crisis (=1)	-0.0504	-0.242	0.956	0.129	-0.170	-0.289	0.815	0.0733
	(1.222)	(0.939)	(0.859)	(0.822)	(1.144)	(0.921)	(0.845)	(0.820)
Growth (%), avg.1996-2007	0.884***	0.510***	0.445	0.348*	0.827***	0.488**	0.432	0.343*
	(0.317)	(0.188)	(0.277)	(0.207)	(0.317)	(0.192)	(0.276)	(0.207)
Growth*GFC (%), avg.2010-2015	0.0226	0.109	-0.429*	-0.0582	0.0765	0.130	-0.366	-0.0329
	(0.349)	(0.285)	(0.235)	(0.244)	(0.321)	(0.284)	(0.230)	(0.246)
Population growth (%), avg. 1996-2015	-0.383*	-0.291	-0.239	-0.238	-0.00321	-0.143	0.00849	-0.138
	(0.228)	(0.204)	(0.148)	(0.154)	(0.219)	(0.173)	(0.152)	(0.141)
Institutional Quality ICRG Index, 1996	-12.73**	-5.333	-14.58***	-6.020*	-19.80***	-8.094*	-19.24***	-7.889*
	(5.677)	(3.563)	(4.250)	(3.325)	(6.006)	(4.362)	(4.498)	(4.004)
Financial Development Index, 1995	1.661	3.025	1.601	3.003	-1.578	1.762	-0.579	2.129
	(3.466)	(2.575)	(2.827)	(2.492)	(3.454)	(2.410)	(2.910)	(2.410)
Total Dependency Ratio, avg. 1996-2015	0.157***	0.0388	0.0288	-0.00867				
	(0.0405)	(0.0397)	(0.0351)	(0.0330)				
Natural Capital Abundance, 1995	-0.380**	-0.135			-0.282	-0.0965		
	(0.166)	(0.141)			(0.180)	(0.133)		

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Young Dependency Ratio, avg. 1996-2015					0.133***	0.0293	0.0200	-0.0122
					(0.0383)	(0.0377)	(0.0338)	(0.0329)
Old Dependency Ratio, avg. 1996-2015					0.517***	0.179**	0.279***	0.0915
					(0.103)	(0.0878)	(0.0987)	(0.0748)
Constant	-4.011	1.753	8.919**	6.530	-2.443	2.364	9.213**	6.648
	(4.775)	(3.670)	(4.341)	(4.038)	(4.704)	(3.731)	(4.285)	(4.067)
Observations	190	190	190	190	190	190	190	190
R-squared	0.428	0.136	0.611	0.212	0.475	0.158	0.632	0.222

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Notes: Before the 2008-9 GFC, there is a strongly statistical and economic significance on the allocative efficiency. Moreover, my 1st paper's results seem even stronger.

Table C1.3: Testing the Exclusion of the year of 2015

1.c) Without a structural break: Total vs Young and Old Dependency Ratios

VARIABLES	(1.a) -CA (%GDP)	(1.b) ΔNFL (%GDP)	(2.a) -CA (%GDP)	(2.b) ΔNFL (%GDP)	(3.a) -CA (%GDP)	(3.b) ΔNFL (%GDP)	(4.a) -CA (%GDP)	(4.b) ΔNFL (%GDP)
Produced Capital Abundance, 1995	1.126	0.0818	0.766*	-0.0348	1.007	0.0367	0.716*	-0.0554
	(0.698)	(0.511)	(0.459)	(0.452)	(0.652)	(0.487)	(0.423)	(0.440)
Net Foreign Assets Abundance, 1995	-2.882**	1.687**	-2.737***	1.734**	-2.644**	1.778**	-2.591***	1.795***
	(1.361)	(0.762)	(0.837)	(0.673)	(1.232)	(0.703)	(0.807)	(0.654)
Human Capital Abundance, 1995	-0.204	-0.343***	-0.508**	-0.442***	-0.0822	-0.297**	-0.404*	-0.399***
	(0.230)	(0.120)	(0.224)	(0.140)	(0.229)	(0.128)	(0.227)	(0.146)
Subsoil Resource Abundance, 1995			-3.303***	-1.017*			-2.990***	-0.887*
			(0.418)	(0.527)			(0.448)	(0.479)
Non-subsoil Resource Abundance, 1995			0.159	0.106			0.198	0.122
			(0.141)	(0.164)			(0.134)	(0.163)
KA Openness Chinn-Ito Index, 1995	-1.750	-0.958	-1.293	-0.810	-1.972	-1.043	-1.476	-0.886
	(2.367)	(1.447)	(1.847)	(1.327)	(2.288)	(1.474)	(1.869)	(1.377)
Real per capita growth (%), avg. 1996-2014	0.994*	0.474	0.0384	0.164	0.981*	0.469	0.105	0.192
	(0.559)	(0.356)	(0.427)	(0.285)	(0.527)	(0.340)	(0.423)	(0.279)
Population growth (%), avg. 1996-2014	-0.200	-0.0557	-0.236	-0.0674	0.0514	0.0402	-0.0669	0.00273
	(0.380)	(0.180)	(0.304)	(0.177)	(0.408)	(0.193)	(0.309)	(0.183)
Institutional Quality ICRG Index, 1996	-8.858	-1.811	-12.61**	-3.028	-18.03**	-5.311	-18.38***	-5.421
	(7.990)	(4.118)	(6.076)	(3.853)	(8.493)	(5.149)	(6.392)	(4.795)
Financial Development Index, 1995	3.713	3.498	2.895	3.233	-0.844	1.760	-0.0518	2.010
	(5.327)	(3.458)	(4.151)	(3.259)	(5.221)	(3.091)	(4.374)	(3.062)
Total Dependency Ratio, avg. 1996-2014	0.159**	0.0190	0.0173	-0.0271				
	(0.0628)	(0.0461)	(0.0528)	(0.0400)				
Natural Capital Abundance, 1995	-0.433*	-0.0863			-0.303	-0.0366		
	(0.250)	(0.175)			(0.262)	(0.159)		
Young Dependency Ratio, avg. 1996-2014					0.142**	0.0125	0.0173	-0.0271
					(0.0572)	(0.0430)	(0.0511)	(0.0401)
Old Dependency Ratio, avg. 1996-2014					0.563***	0.173	0.295**	0.0881
					(0.148)	(0.115)	(0.143)	(0.101)

Constant	-7.112	1.073	9.613	6.494	-4.494	2.071	10.02	6.663
	(7.677)	(5.015)	(6.855)	(4.790)	(7.458)	(4.879)	(6.760)	(4.819)
Observations	95	95	95	95	95	95	95	95
R-squared	0.414	0.223	0.606	0.301	0.476	0.258	0.633	0.318

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Notes: results show no much changes. Excluding one year from the sample did not change much while I see some stronger significance in my first chapter's findings.

Table C1.4: Testing the Exclusion of the year of 2015

1.d) With a structural break: Total vs Young and Old Dependency Ratios

VARIABLES	(1.a) -CA (%GDP)	(1.b) ΔNFL (%GDP)	(2.a) -CA (%GDP)	(2.b) ΔNFL (%GDP)	(3.a) -CA (%GDP)	(3.b) ΔNFL (%GDP)	(4.a) -CA (%GDP)	(4.b) ΔNFL (%GDP)
Produced Capital Abundance, 1995	1.171**	0.102	0.803**	-0.0216	1.048**	0.0550	0.749**	-0.0435
	(0.490)	(0.357)	(0.324)	(0.315)	(0.458)	(0.341)	(0.299)	(0.306)
Net Foreign Assets Abundance, 1995	-2.973***	1.642***	-2.775***	1.708***	-2.736***	1.732***	-2.636***	1.765***
	(0.958)	(0.548)	(0.558)	(0.467)	(0.864)	(0.503)	(0.536)	(0.452)
Human Capital Abundance, 1995	-0.138	-0.310***	-0.480***	-0.425***	-0.0225	-0.266***	-0.381**	-0.384***
	(0.156)	(0.0853)	(0.156)	(0.0998)	(0.154)	(0.0899)	(0.156)	(0.102)
Subsoil Resource Abundance, 1995			-3.327***	-1.050***			-3.038***	-0.933***
			(0.297)	(0.374)			(0.317)	(0.340)
Non-subsoil Resource Abundance, 1995			0.164	0.117			0.206**	0.134
			(0.102)	(0.116)			(0.0971)	(0.115)
KA Openness Chinn-Ito Index, 1995	-1.667	-0.946	-0.844	-0.671	-1.976	-1.063	-1.103	-0.776
	(1.675)	(1.069)	(1.283)	(0.933)	(1.625)	(1.095)	(1.313)	(0.978)
After the 2008-09 Global Financial Crisis (=1)	0.0268	0.0513	1.000	0.377	-0.0689	0.0151	0.869	0.323
	(1.267)	(0.844)	(0.860)	(0.713)	(1.173)	(0.811)	(0.852)	(0.705)
Growth (%), avg.1996-2007	0.921***	0.430***	0.405	0.258	0.847***	0.402**	0.394	0.253
	(0.305)	(0.164)	(0.263)	(0.176)	(0.310)	(0.168)	(0.266)	(0.176)
Growth*GFC (%), avg.2010-2014	-0.0112	-0.0215	-0.419*	-0.158	0.0289	-0.00631	-0.364	-0.135
	(0.356)	(0.247)	(0.241)	(0.199)	(0.325)	(0.238)	(0.233)	(0.197)
Population growth (%), avg. 1996-2014	-0.183	-0.0483	-0.179	-0.0468	0.0524	0.0408	-0.0260	0.0150
	(0.258)	(0.124)	(0.201)	(0.119)	(0.278)	(0.130)	(0.204)	(0.122)
Institutional Quality ICRG Index, 1996	-11.17*	-2.951	-13.74***	-3.812	-19.96***	-6.277*	-19.27***	-6.049*
	(5.727)	(2.975)	(4.197)	(2.703)	(6.115)	(3.659)	(4.406)	(3.295)
Financial Development Index, 1995	2.861	3.090	2.245	2.884	-1.474	1.449	-0.527	1.761
	(3.775)	(2.451)	(2.837)	(2.241)	(3.527)	(2.125)	(2.926)	(2.087)
Total Dependency Ratio, avg. 1996-2014	0.149***	0.0131	0.0179	-0.0308				
	(0.0426)	(0.0307)	(0.0351)	(0.0268)				
Natural Capital Abundance, 1995	-0.422**	-0.0790			-0.293	-0.0303		
	(0.181)	(0.124)			(0.188)	(0.113)		

Young Dependency Ratio, avg. 1996-2014					0.131***	0.00637	0.0156	-0.0317
					(0.0390)	(0.0287)	(0.0339)	(0.0269)
Old Dependency Ratio, avg. 1996-2014					0.540***	0.161**	0.281***	0.0757
					(0.104)	(0.0802)	(0.0956)	(0.0679)
Constant	-5.544	1.920	8.962**	6.770**	-2.792	2.961	9.722**	7.078**
	(5.016)	(3.127)	(4.416)	(3.145)	(4.929)	(3.100)	(4.342)	(3.183)
Observations	190	190	190	190	190	190	190	190
R-squared	0.415	0.222	0.619	0.310	0.474	0.255	0.642	0.325

Notes: the distinction between Agg.KN vs Dis.KN seems of high importance-- only with the aggregated natural capital, I find that before the 2008-9 GFC, there is a strongly statistical and economic significance on the allocative efficiency. Overall results from all tables A1.(1-4) suggest we distinguish between KN types when we continue with disaggregated capital flows.

Table C2: List of Countries

	Country Code	Country Name	Region Group	Income Group
1	ALB	Albania	Europe & Central Asia	LMC
2	ARG	Argentina	Latin America & Caribbean	UMC
3	BGD	Bangladesh	South Asia	LIC
4	BOL	Bolivia	Latin America & Caribbean	LMC
5	BWA	Botswana	Sub-Saharan Africa	UMC
6	BRA	Brazil	Latin America & Caribbean	UMC
7	BGR	Bulgaria	Europe & Central Asia	UMC
8	BFA	Burkina Faso	Sub-Saharan Africa	LIC
9	CMR	Cameroon	Sub-Saharan Africa	LMC
10	CHL	Chile	Latin America & Caribbean	UMC
11	CHN	China	East Asia & Pacific	LMC
12	COL	Colombia	Latin America & Caribbean	UMC
13	COG	Congo	Sub-Saharan Africa	LMC
14	CRI	Costa Rica	Latin America & Caribbean	UMC
15	CIV	Cote d'Ivoire	Sub-Saharan Africa	LMC
16	DOM	Dominican Republic	Latin America & Caribbean	UMC
17	ECU	Ecuador	Latin America & Caribbean	LMC
18	EGY	Egypt	Middle East & North Africa	LMC
19	SLV	El Salvador	Latin America & Caribbean	LMC
20	ETH	Ethiopia	Sub-Saharan Africa	LIC
21	GAB	Gabon	Sub-Saharan Africa	UMC
22	GMB	Gambia	Sub-Saharan Africa	LIC
23	GHA	Ghana	Sub-Saharan Africa	LIC
24	GTM	Guatemala	Latin America & Caribbean	LMC
25	GIN	Guinea	Sub-Saharan Africa	LIC
26	HND	Honduras	Latin America & Caribbean	LMC
27	HUN	Hungary	Europe & Central Asia	HIC
28	IND	India	South Asia	LMC
29	IDN	Indonesia	East Asia & Pacific	LMC
30	JAM	Jamaica	Latin America & Caribbean	UMC
31	JOR	Jordan	Middle East & North Africa	LMC
32	KEN	Kenya	Sub-Saharan Africa	LIC
33	KOR	Korea, Republic of	East Asia & Pacific	HIC
34	LBN	Lebanon	Middle East & North Africa	UMC
35	MDG	Madagascar	Sub-Saharan Africa	LIC
36	MWI	Malawi	Sub-Saharan Africa	LIC
37	MYS	Malaysia	East Asia & Pacific	UMC
38	MLI	Mali	Sub-Saharan Africa	LIC
39	MLT	Malta	Middle East & North Africa	HIC
40	MEX	Mexico	Latin America & Caribbean	UMC
41	MNG	Mongolia	East Asia & Pacific	LMC
42	MAR	Morocco	Middle East & North Africa	LMC

	Country Code	Country Name	Region Group	Income Group
43	MOZ	Mozambique	Sub-Saharan Africa	LIC
44	NIC	Nicaragua	Latin America & Caribbean	LMC
45	NER	Niger	Sub-Saharan Africa	LIC
46	NGA	Nigeria	Sub-Saharan Africa	LMC
47	OMN	Oman	Middle East & North Africa	HIC
48	PAK	Pakistan	South Asia	LMC
49	PAN	Panama	Latin America & Caribbean	UMC
50	PNG	Papua New Guinea	East Asia & Pacific	LMC
51	PRY	Paraguay	Latin America & Caribbean	LMC
52	PER	Peru	Latin America & Caribbean	UMC
53	PHL	Philippines	East Asia & Pacific	LMC
54	POL	Poland	Europe & Central Asia	UMC
55	SEN	Senegal	Sub-Saharan Africa	LIC
56	SLE	Sierra Leone	Sub-Saharan Africa	LIC
57	ZAF	South Africa	Sub-Saharan Africa	UMC
58	LKA	Sri Lanka	South Asia	LMC
59	TZA	Tanzania	Sub-Saharan Africa	LIC
60	THA	Thailand	East Asia & Pacific	LMC
61	TGO	Togo	Sub-Saharan Africa	LIC
62	TUN	Tunisia	Middle East & North Africa	LMC
63	TUR	Turkey	Europe & Central Asia	UMC
64	UGA	Uganda	Sub-Saharan Africa	LIC
65	URY	Uruguay	Latin America & Caribbean	UMC
66	VEN	Venezuela	Latin America & Caribbean	UMC
67	VNM	Vietnam	East Asia & Pacific	LIC
68	YEM	Yemen	Middle East & North Africa	LIC
69	ZMB	Zambia	Sub-Saharan Africa	LIC

Table C3: Indirect (Residual-Based) Measures of Private Flows

	(1.a)	(1.b)	(2.a)	(2.b)	(3.a)	(3.b)	(4.a)	(4.b)
VARIABLES	The ***residual*** using the ***public*** definition				The ***residual*** using the ***sovereign*** definition			
Produced Capital Abundance, 1995	0.487*	0.576**	0.512*	0.580*	0.604**	0.665**	0.421*	0.456**
	(0.282)	(0.286)	(0.290)	(0.293)	(0.281)	(0.290)	(0.225)	(0.226)
Net Foreign Assets Abundance, 1995	-3.188***	-3.192***	-3.203***	-3.242***	-0.375	-0.384	-1.051	-1.092
	(1.081)	(1.027)	(1.188)	(1.136)	(0.804)	(0.794)	(0.754)	(0.736)
Human Capital Abundance, 1995	-0.532***	-0.496***	-0.484***	-0.460**	-0.393**	-0.370**	-0.363**	-0.362**
	(0.180)	(0.175)	(0.183)	(0.180)	(0.160)	(0.155)	(0.166)	(0.163)
Subsoil Resource Abundance, 1995	-3.054***	-3.109***	-2.919***	-3.015***	-1.440***	-1.474***	-1.653***	-1.695***
	(0.395)	(0.363)	(0.470)	(0.446)	(0.374)	(0.355)	(0.389)	(0.375)
Non-subsoil Resource Abundance, 1995	0.164**	0.168*	0.204**	0.214**	-0.304***	-0.302***	-0.0203	-0.0270
	(0.0827)	(0.0859)	(0.0992)	(0.107)	(0.0848)	(0.0868)	(0.0844)	(0.0894)
After the 2008-09 Global Financial Crisis (=1)		1.460		1.482		0.924		1.613
		(1.182)		(1.224)		(1.364)		(1.299)
Growth (%), avg.1996-2007		0.707***		0.647**		0.491**		0.173
		(0.245)		(0.271)		(0.189)		(0.201)
Growth*GFC (%), avg.2010-2014		-0.501*		-0.508*		-0.317		-0.553*
		(0.286)		(0.305)		(0.304)		(0.291)
Population growth (%), avg. 1996-2014	-0.130	-0.0377	-0.0952	-0.00467	-0.375	-0.313	-0.206	-0.141
	(0.279)	(0.265)	(0.282)	(0.267)	(0.312)	(0.303)	(0.293)	(0.280)
KA Openness Chinn-Ito Index, 1995	0.0446	0.525	0.530	0.861	0.478	0.824	0.241	0.511
	(1.860)	(1.844)	(1.834)	(1.826)	(2.096)	(2.113)	(2.001)	(2.010)
Institutional Quality ICRG Index, 1996	-4.870	-6.193	-7.443	-8.466	-1.037	-1.923	-8.325	-8.473
	(5.117)	(5.173)	(5.343)	(5.324)	(5.468)	(5.528)	(5.789)	(5.711)
Financial Development Index, 1995	-4.154	-5.021	-3.113	-4.453	3.391	2.753	-1.499	-2.415
	(3.245)	(3.079)	(3.746)	(3.659)	(3.599)	(3.547)	(3.254)	(3.242)
Real per capita growth (%), avg. 1996-2014	0.303		0.259		0.213		-0.311	
	(0.262)		(0.326)		(0.225)		(0.270)	
Young Dependency Ratio, avg. 1996-2014			0.0160	0.00426			-0.152***	-0.153***
			(0.0544)	(0.0541)			(0.0456)	(0.0464)
Old Dependency Ratio, avg. 1996-2014			0.205	0.158			0.0166	-0.00839

			(0.137)	(0.135)			(0.109)	(0.113)
Constant	8.912**	8.016**	6.512	6.920	3.336	2.731	17.70***	16.81***
	(3.921)	(3.980)	(6.625)	(6.478)	(3.583)	(3.542)	(6.445)	(6.284)
Observations	138	138	138	138	138	138	138	138
R-squared	0.485	0.520	0.494	0.526	0.258	0.283	0.358	0.381

Robust standard errors in parentheses

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