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ORIGINAL PAPER

Attracting private capital for development: Are poorer countries less efficient?

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Abstract

According to common measures of private capital mobilization, such as the shares of foreign direct and portfolio investment in GDP, many low-income countries perform poorly in attracting private capital flows. However, these indicators do not account for differences in economic characteristics across countries, and thus cannot provide insights on countries' performance relative to their potential levels of private capital flows as determined by their domestic economic structure and constraints. This paper addresses this gap by using nonparametric data envelopment analysis (DEA) to empirically calculate the efficient frontier for private capital mobilization as a function of countries' domestic enabling environment, and then assess each country's performance relative to that of other countries featuring similar domestic conditions. Our results reveal that many low-income countries, particularly in Africa and South Asia, which do not rank high according to achieved levels of private capital flows, are in fact performing on or very close to the efficient frontier. This indicates that these countries are good performers given the limited resources available to them. Tracking the performance of countries and regions over time, we furthermore find that sub-Saharan Africa experienced the strongest increases in DEA efficiency scores between 2007 and 2018, indicating that various countries in this region were catching up with the frontier.

Keywords Capital flows · Foreign direct investment · Developing countries · Data envelopment analysis

JEL Classification F21 · F32 · F65 · O19

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1 Introduction

Mobilizing private capital is increasingly being recognized as a key factor for achieving international development goals. While technological solutions to many challenges faced by developing countries are often readily available, estimates of the United Nations suggest that there is a gap of USD 2–3 trillion per year between the amount of capital needed to achieve the Sustainable Development Goals (SDGs) by 2030 and the financial resources currently available from government and development aid (UNCTAD 2014).[1] In response to this need, development banks and organizations are increasingly using their funds to mobilize and leverage private capital (AfDB et al. 2019; World Bank 2020).

Despite the prominence of such efforts on the international development agenda, the empirical evidence that allows policymakers to quantify and compare countries' achievements in mobilizing private capital, map achieved progress against stated goals, and guide decision making, is currently very limited. Specifically, indicators commonly used to capture differences in countries' performance in attracting private capital are often based exclusively on achieved outcomes (e.g., attracted foreign direct and portfolio investment relative to GDP) which do not account for the different economic conditions and constraints faced by different countries. Given that poorer countries often feature less-favorable infrastructure and economic conditions for generating private capital flows, it is not surprising that many low-income countries are found to perform poorly in attracting private capital according to these indicators (see the results presented in Sect. 4, Fig. 1). It is important to note, however, that the results obtained based on these indicators provide little insights on how efficient countries are in mobilizing private capital, i.e., how well they are performing relative to their potential levels of private capital flows as determined by their domestic economic structure and constraints.

This paper addresses this gap by using a non-parametric frontier analysis approach based on data envelopment analysis (DEA) to estimate countries' performance in mobilizing private capital relative to their enabling domestic environment. Our results reveal that many low-income countries, particularly in Africa and South Asia, which do not rank high according to achieved levels of private capital flows relative to GDP are in fact performing on or very close to the efficient frontier, indicating that these countries are good performers given the resources available to them. These results thus complement the insights of existing studies by providing a different perspective on countries' achievements than those obtained from indicators which only capture achieved outcomes. In addition, the frontier analysis allows us to derive quantitative estimates of the untapped mobilization potential in each country, i.e., the magnitude by which countries should in principle be able to increase their private capital flows given their currently available economic resources and conditions. Tracking the performance of countries and regions over time, we find that sub-Saharan Africa experienced the strongest

[1] For example, green technology solutions are available for a large range of sectors but sustained action on climate change requires private investment to improve efficiency, reduce externalities, and expand relevant partnerships (SDG 17).

increases in DEA efficiency scores among all regions between 2007 and 2018, indicating that various countries in this region were catching up with the frontier.

DEA is a widely used, non-parametric method for estimating production possibility frontiers based on linear programming (some methodological background is provided below; for more details, see Charnes et al. 1978 and Coelli et al. 2005). Our application of DEA is tailored to the context of private capital mobilization and involves three steps. First, we quantify achieved levels of aggregate private capital flows for 135 countries covering all income groups and geographical regions, focusing on foreign direct investment (FDI), portfolio equity investment, and private sector borrowing. Second, we use DEA to estimate the empirical production possibility frontier for aggregate private capital flows as a function of countries' domestic economic enabling environment, which is proxied by a composite index capturing various economic factors and constraints. The selection of the variables included in this index is based on a structured literature review on the factors that are commonly identified as being correlated with countries' achieved private capital flows. Third, we calculate countries' performance in attracting private capital relative to the estimated frontier. This allows us to identify those countries that generate relatively high levels of private capital compared to other countries facing similar economic conditions and constraints, and those countries that apparently fall short of their potential.

This paper is mainly linked to two bodies of literature. First, our analysis both builds on and expands existing approaches to assess countries' performance in mobilizing private capital flows. Most studies in this literature use regression-based methods to identify factors that are correlated with indicators of countries' achieved magnitudes of private capital flows, and estimate the effects of changes in these factors on achieved outcomes (a structured review of this literature is presented in Appendix A). We build on the findings of these studies to inform our selection of variables included as input factors in the DEA. At the same time, we make several contributions to this literature. In particular, by using a non-parametric frontier approach to estimate countries' relative performance in attracting private capital, we add to the range of methods that has been used in this literature (to the best of our knowledge, this is the first paper that applies DEA in the context of private capital mobilization). We argue that the approach proposed in this paper can complement the insights obtained from existing studies in the following ways. First, DEA has the feature that it involves fewer assumptions about the structure of the data than parametric methods such as regression-based analyses. Consequently, the results generated using DEA tend to be easier to interpret and are not subject to the same econometric challenges that studies based on regression analysis typically face.[2]

[2] DEA and regression analysis represent alternative methods for performance assessments, each featuring its own set of advantages and weaknesses (see Thanassoulis 1993; Sickles and Zelenyuk 2019). While regression analysis provides more tools for identifying causal relationships in observational data, it also tends to involve stronger assumptions on the structure of the underlying data than non-parametric methods, causing it to be more sensitive to econometric challenges such as endogeneity and omitted variable bias. Since the purpose of our analysis—to measure and compare mobilized capital flows relative to countries' economic characteristics—does not involve making causal claims, DEA is an appropriate method for this study.

Another important feature of DEA is that the estimated efficiency scores for a given unit (e.g., country) are based on the performance of a subset of efficient units in the sample with similar enabling factors as the considered unit. In contrast, regression-based approaches rely on comparisons relative to the average performance across all units in the sample. If the considered units are very heterogeneous (as is the case when analyzing countries from different parts of the world with different economic structures and stages of development), then DEA has the advantage that the estimates for any given country are not determined by other countries with fundamentally different characteristics and prospects, but only by those countries that feature comparable values of the included enabling factors.

Second, we add to the growing number of empirical studies in macroeconomics applying non-parametric frontier analysis. Existing studies in this literature focus on estimating efficiency of public spending (Gupta and Verhoeven 2001; Clements 2002; Afonso et al. 2005; Herrera and Pang 2005), national transportation and commerce systems (Rashidi and Cullinane 2019; Wang et al. 2020), regional economic integration (Naeher 2015; Naeher and Narayanan 2020), domestic revenues (Bogetić et al. 2021), and energy efficiency (Li et al. 2021).

By expanding the application of DEA to the context of private capital mobilization, our analysis generates new results that are useful for guiding policymaking in the international investment and development context. Specifically, the efficiency scores for individual countries that we obtain through DEA can help to inform decisions about how to allocate limited development funds to best leverage private capital by targeting those countries or regions with the largest untapped potential for generating additional private capital flows. These results should be seen as complementing the insights obtained from existing cross-country comparisons of achieved levels of private capital flows which do not account for differences in enabling economic factors across countries.

The remainder of the paper is structured as follows. Section 2 provides a brief introduction to data envelopment analysis and explains how the method is used to estimate countries' performance in attracting private capital flows relative to their domestic enabling environment. Section 3 describes the variables and data sources used in the empirical analysis. Section 4 presents the results. Section 5 discusses the robustness of the results to alternative specifications. Section 6 concludes.

2 Methodology

2.1 Data envelopment analysis

DEA is a non-parametric method for estimating efficiency relative to an empirically determined production possibility frontier, which has been applied in a wide range of fields in economics.[3] In its standard form applied here, DEA assumes the

[3] For a detailed introduction to DEA we refer to Charnes et al. (1978) and Coelli et al. (2005). As mentioned in Sect. 1, DEA provides an alternative method to regression-based approaches for performance assessment. For a more elaborated discussion of the respective strengths and weaknesses of these approaches, see Thanassoulis (1993) and Sickles and Zelenyuk (2019).

existence of a convex production possibility set and estimates the frontier as the maximum attainable level of output for a given level of input. Efficiency is measured as the distance between an observed input–output combination and the corresponding point on the estimated frontier. Intuitively, units that produce more output with the same amount of input (or units that need less input for the same amount of output) are considered more efficient than others. The efficiency scores obtained from DEA are normalized to range between 0 and 1, where units located on the frontier are assigned the maximum value of 1.

In the context of private capital mobilization, DEA can be used to assess countries' achievements in attracting private capital relative to the quality of their domestic enabling environment (i.e., the economic conditions and constraints identified in the literature that determine each country's potential capital flows). For this purpose, we apply DEA to calculate the empirical production possibility frontier for private capital flows, and then rate the performance of each country relative to the frontier. Overall, this provides an estimate of the capital flows that each country should potentially be able to achieve based on what countries with similar characteristics and enabling factors are achieving. The obtained efficiency scores can be interpreted as follows. Scores close to one indicate that a country is attracting relatively large amounts of private capital given its domestic environment, i.e., the country is "efficient" in attracting private capital. DEA scores well below one indicate inefficiency or "untapped potential." For example, an efficiency score of 0.5 indicates that a country is currently only generating half of the capital flows that it should theoretically be able to, based on its performance relative to the estimated frontier. In line with the obtained efficiency scores, untapped capital mobilization potential is defined as the distance between a country's current level of private capital flows and the theoretically possible level as captured by the estimated frontier.[4]

It should be noted that the estimates obtained from DEA are based exclusively on currently available resources and conditions, not on potential future developments. Our analysis thus does not seek to forecast capital flows under possible scenarios of future changes in political or economic conditions. Instead, the analysis compares levels of private capital flows across countries at a given point in time and identifies those countries that, relative to others with similar domestic conditions, are currently performing below the level which they should potentially be able to. Furthermore, it should be noted that the obtained estimates relate only to the considered measure of aggregate private capital flows and, as such, do not provide direct implications for potential welfare gains or growth effects associated with attracting more private capital.

[4] Note that the estimates obtained from DEA should be interpreted as providing lower bounds of untapped mobilization potential, since countries located on the frontier are assumed to feature zero untapped potential by definition, even though there may still be scope for further enhancement in these countries as well (there are simply no other countries in the sample that can serve as benchmarks).

2.2 Aggregate private capital flows and enabling environment

In the economic literature, the factors determining private capital flows across countries are usually divided into external "push" factors and domestic "pull" factors (Calvo et al. 1993; Fernandez-Arias 1996; Hannan 2018).[5] Push factors are supply-side factors that affect the supply of global liquidity and investors' willingness to increase exposure to higher-risk investments. For example, push factors include variables like global risk aversion, global commodity prices, and interest rates in the USA or other advanced economies (IMF 2016; Reinhart et al. 2016). Pull factors are domestic characteristics that attract foreign investors to a particular country, such as local macroeconomic conditions, regulations, governance, and market imperfections (Fernandez-Arias and Montiel 1996; Ghosh et al. 2014).

Since our analysis is concerned with estimating differences across countries rather than explaining developments in the overall size of global capital flows, we focus on domestic (pull) factors. There are various empirical indicators that have been identified in the literature as being important in this context. While we seek to account for all relevant factors, it would go beyond the scope of this study to analyze each of the factors separately. We therefore construct a composite measure of pull factors which we use to approximate the overall investment climate and enabling environment for private capital mobilization in each country. In aggregating the information from different indicators into a single composite measure we apply standard normalization and weighting methods which are also used in the construction of other well-known composite indices, such as the Doing Business Index and the Unit Nation's Human Development Index, and which are in line with the guidelines of constructing composite indices laid out by the OECD (2008). The following provides a description of the methodology underlying the construction of our composite measure. Alternative specifications and aggregation schemes are discussed as part of the robustness tests in Sect. 5.

The selection of variables included in our composite measure of the enabling environment is based on a structured literature review (the exact procedure is described in Appendix A). According to the results of this literature review, we construct our measure to capture seven aspects (dimensions) of countries' domestic enabling environment[6]: (i) market-related factors such as capital return and growth potential, (ii) institutional and regulatory quality, (iii) openness to trade, (iv) economic and political stability, (v) infrastructure development, (vi) financial development, and (vii) natural and human resources. Each of these seven dimensions comprises two empirical indicators. For example, dimension II (institutional and regulatory quality) is composed of subindicators II.a (political regime type) and II.b (business regulation environment). There are, of course, many other factors potentially affecting private capital flows than the 14 variables

[5] This distinction is based on the portfolio balance approach, according to which capital flows are driven by expected returns, perceived risk, and risk preferences across countries (Ahmed and Zlate 2014; Hannan 2017).

[6] The considered dimensions are broadly in line with the classifications used in other policy-related studies on private capital flows, e.g., World Bank (2011, 2018), Fay et al. (2018), and Hannan (2018).

considered here.[7] The constructed composite measure should be thought of as a proxy variable capturing the broader enabling environment for private capital mobilization in each country.

To facilitate aggregation into a single composite measure, all indicators are normalized such that higher values indicate more favorable conditions, and all indicators feature comparable ranges of values. There are several possible methods for rescaling, each featuring its own set of advantages. We apply standard min–max rescaling, which ensures that all normalized variables range between 0 and 1.[8] For country i in the overall sample N, indicator I is normalized using the formula:

$$I_i^* = \frac{I_i - \min_{i \in N}(I_i)}{\max_{i \in N}(I_i) - \min_{i \in N}(I_i)} \tag{1}$$

Since this normalization method is very sensitive to outliers, we winsorize all variables at the 98% level before applying min–max rescaling. This effectively caps the two or three most extreme values in each variable and ensures that the aggregated values are not driven by a few outliers.

The construction of the composite measure involves two steps of aggregation. First, within each dimension, two indicators are combined into one measure for that dimension. Second, the seven dimensions are aggregated into the final measure. At both levels of aggregation, an equal weighting scheme is applied to combine the respective subindicators (alternative weighting schemes, including principal component analysis, are explored as part of the robustness tests in Section 5). The use of equal weights facilitates the interpretation of the results and is in line with many other studies that construct composite indices, including studies with the particular purpose of using these indices in data envelopment analysis (Afonso et al. 2005; Herrera and Pang 2005). Since each dimension enters the composite measure with equal weight, the resulting scores can be interpreted as the average performance of a given country along the considered dimensions of the domestic environment (the same applies to each of the seven dimensions individually across the two respective subindicators).

In the DEA, the composite measure of countries' domestic enabling environment represents the input variable (we therefore also refer to this measure as the DEA input index). Accordingly, the DEA output variable captures countries' aggregate private capital flows. Throughout the analysis, we focus on three types of capital flows, namely FDI, portfolio equity investment, and private sector borrowing (all

[7] For example, health-related aspects of human capital (e.g., general health of the labor force) might also constitute a relevant pull factor of private capital flows. However, health indicators are not widely used in the studies found in our structured literature review (see Table 3 in the Appendix). One reason for this may be limited data availability for relevant population health outcomes, especially in low-income settings where vital registration (i.e., systems that record births, deaths, and causes of death) are often weak.

[8] The same method is used in the construction of other well-known composite indices, such as the Doing Business Index and the Unit Nation's Human Development Index.

expressed relative to a country's GDP). To make the analysis more tractable, we aggregate the information on these three variables into a single composite measure using the same methodology as for the DEA input index (i.e., normalization via min–max rescaling and aggregation using equal weights). The resulting aggregate measure of private capital flows greatly facilitates the computation and interpretation of DEA as it reduces the number of output variables to one and thus allows us to plot the frontier in two-dimensional space. One should think of this aggregate measure of private capital flows as a normalized proxy of the magnitudes of private capital flows relative to GDP in each country.

3 Data and variables

Table 1 provides a list of the variables and respective data sources used in the analysis. The data that support the findings of this study are publicly available from the World Bank's Open Data Portal (https://data.worldbank.org) and the other sources described in Table 1. Panel A of Table 1 describes the indicators for the three types of capital flows used as output variables in the DEA. According to the definition of the OECD (2021), private capital flows can be divided into FDI, portfolio equity (the buying and selling of stocks and shares), remittances sent home by migrants, and private sector borrowing. Because governments tend to have a limited ability to influence remittances flows, we focus on FDI, portfolio equity, and private sector borrowing, which can typically be more directly affected by policy. The indicators for FDI and portfolio equity both measure net inflows as a percentage of a country's GDP. The indicator used to capture private sector borrowing measures domestic credit to the private sector as a percentage of a country's GDP. While FDI and portfolio equity represent the most important forms of international private capital flows in most countries, private sector borrowing reflects domestic capital flows.

Panel B of Table 1 lists the 14 variables used to construct the composite measure of the domestic enabling environment (DEA input index). Each of the seven dimensions of the enabling environment is based on two empirical indicators which were selected based on the structured literature review described in Appendix A. In line with other studies (Edwards 1990; Asiedu 2002), we use the inverse of per-capita GDP as a proxy for capital return. This approach is based on the idea that the return on capital is equal to the marginal product of capital, which implies that, all other factors being equal, investments in countries with higher per capita incomes will tend to yield a lower return, and therefore real GDP per capita should be inversely related to foreign investment. In addition, the inverse relationship may also reflect a perception that investment risk rises as per capita GDP declines, and thus investors tend to require higher returns to offset the perceived greater risk. Since discussing the intuition behind all the indicators included in the construction of the DEA input index it would go beyond the scope of this study, we refer the reader to the detailed reviews provided in Chakrabarti (2001) and Asiedu (2002), as well as to the other studies listed in Table 3 (in the Appendix).

The sample consists of all countries for which sufficient data on the variables listed in Table 1 are available. This results in a total of 135 countries, comprising 26

Table 1 List of variables and data sources

Indicator (and subindicators)			Description and available years	Source
Panel A: private capital flows (DEA outputs)				
FDI		Foreign direct investment, net inflows (% of GDP); 2007–2017		World Bank
Portfolio equity		Portfolio equity, net inflows (% of GDP); 2007–2017		World Bank
Private sector borrowing		Domestic credit to private sector (% of GDP); 2007–2017		World Bank
Panel B: domestic enabling environment (DEA input index)				
I. Market-related factors	I.a	Market size and capital return	Inverse of real GDP per capita (constant 2010 US$); 2007–2017	World Bank
	I.b	Growth potential	GDP growth (annual %); 2007–2017	World Bank
II. Institutional and regulatory quality	II.a	Political regime type	Combined polity score, scale from − 10 (strongly autocratic) to 10 (strongly democratic); 2007–2017	Center for Systemic Peace, Polity IV Project
	II.b	Business regulation	Ease of doing business score, scale from 0 (worst) to 100 (best) regulatory performance; 2010–2018	World Bank, Doing Business project
III. Openness	III.a	Trade openness	Sum of exports and imports of goods and services (% of GDP); 2007–2017	World Bank
	III.b	Market openness	Index of economic freedom, average score for trade, investment, and financial freedom, scale from 0 (lowest) to 100 (highest) degree of freedom; 2007–2018	Heritage Foundation
IV. Economic and political stability	IV.a	Inflation	Inverse of the inflation rate (annual %); 2007–2017	IMF
	IV.b	Political stability	Political stability and absence of violence, scale from − 2.5 (lowest) to 2.5 (highest) stability; 2007–2017	World Bank, Governance Indicators

Table 1 (continued)

Indicator (and subindicators)			Description and available years	Source
V. Infrastructure	V.a	Logistics	Logistics Performance Index, overall score; 2007, 2010, 2012, 2014, 2016, 2018	World Bank, Logistics Performance Index
	V.b	IT	Fixed broadband subscriptions per 100 people; 2007–2017	World Bank
VI. Financial development	VI.a	Financial depth	Liquid liabilities (% of GDP); 2007–2016	IMF
	VI.b	Banking competition	Inverse of 5-bank asset concentration; 2007–2016	World Bank (citing Bankscope)
VII. Natural and human resources	VII.a	Natural resources	Total natural resources rents (% of GDP); 2007–2016	World Bank
	VII.b	Skilled workforce	Secondary school enrollment (% net); 2007–2017	World Bank

Source: Authors' compilation

low-income countries (LIC), 37 lower-middle income countries (LMIC), 39 upper-middle income countries (UMIC), and 33 high income countries (HIC). For most of these countries, data are available annually for the period between 2007 and either 2017 or 2018. In order to limit the role of temporary fluctuations and measurement error, most of the analysis uses average values of 4-year periods, which are constructed as the mean values for all available years within the periods 2007–2010, 2011–2014, and 2015–2018, respectively (for ease of exposition, all tables and figures refer to these time periods, even if the available data are only available for a subset of years). Additional measures to address issues resulting from missing data are reported in Appendix B.

4 Empirical results

4.1 Descriptive analysis

Figure 1 shows the resulting values of the normalized measure of aggregate private capital flows for the period 2015–2018 by income group (**A**) and by region (**B**). According to the results in **A**, countries with lower income levels tend to mobilize less private capital relative to GDP than richer countries. Considering the disaggregated values for the three included types of capital flows furthermore shows that these differences are mainly driven by differences in private sector borrowing and (to a lesser extent) portfolio equity.[9] Figure 1B shows that private capital flows also vary widely by geographical region. Especially the countries in South Asia and sub-Saharan Africa (which together comprise 23 of the 26 LICs in our sample) are found to generate less private capital than countries in other regions, on average.

At the same time, countries with lower income levels also tend to feature less favorable economic conditions for generating private capital flows. This can be seen in Fig. 2, which plots average values of our composite measure of the domestic enabling environment (DEA input index) across income groups for the same period 2015–2018 (recall that higher values of the DEA input index indicate more favorable conditions for attracting private capital flows). Simple averages across income groups are: LIC (0.39), LMIC (0.43), UMIC (0.47), and HIC (0.61).[10] In line with these results, the individual countries with the most favorable conditions are Switzerland (0.72), the Netherlands (0.71), Ireland (0.70), UK (0.69), and Japan (0.69),

[9] While the average quantitative role of FDI in total private capital flows appears to be very similar across income groups, results for individual countries reveal that there is strong variation in FDI inflows relative to GDP at the country level, including among countries belonging to the same income group. In particular, this suggests that policies aimed at mobilizing more private capital will have to target different types of capital flows to be most effective, even among countries featuring similar income levels.

[10] The corresponding values of the DEA input index for regions are: South Asia (0.41), Sub-Saharan Africa (0.41), Middle East & North Africa (0.44), Latin America & Caribbean (0.47), East Asia & Pacific (0.52), and Europe & Central Asia (0.55).

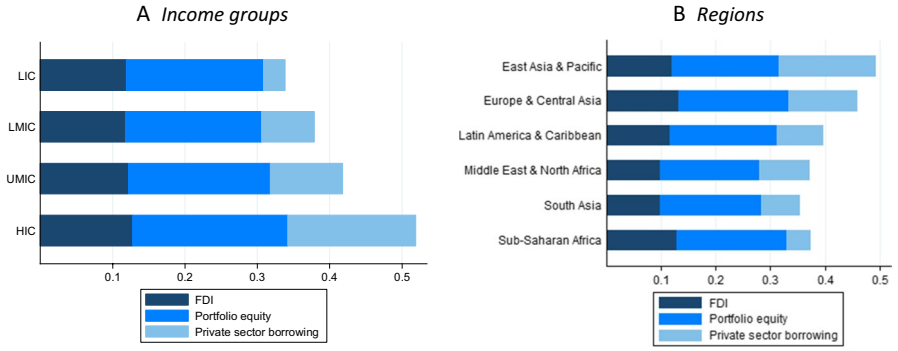

Fig. 1 Private capital flows by income group and region, 2015–2018. **A** Income groups. **B** Regions. Depicted values are normalized and aggregated as described in Sect. 2. The sample in **A** consists of 135 countries. **B** Excludes Canada and the USA. Source: Authors' illustration based on the variables and data sources described in Table 1

all of which are classified as HIC. Countries with the weakest environments are Yemen (0.21), Angola (0.26), Central African Republic (0.29), Haiti (0.30), and Nigeria (0.31).

The finding that poorer countries tend to feature less-favorable economic conditions for generating private capital flows also holds for individual dimensions of the domestic enabling environment. In particular, Fig. 2 shows that except for Dimension I (market-related factors, i.e., capital return and growth potential) of the DEA input index there is a clear positive relationship between income levels and enabling factors, with HICs featuring the most favorable conditions across all dimensions except Dimension I. Based on the normalized values shown in Fig. 2, institutions (Dimension II) and economic and political stability (Dimensions IV) play the largest roles in determining the quality of countries' domestic enabling environment.

The fact that countries with lower levels of private capital mobilization also tend to feature less favorable economic conditions for generating private capital suggests

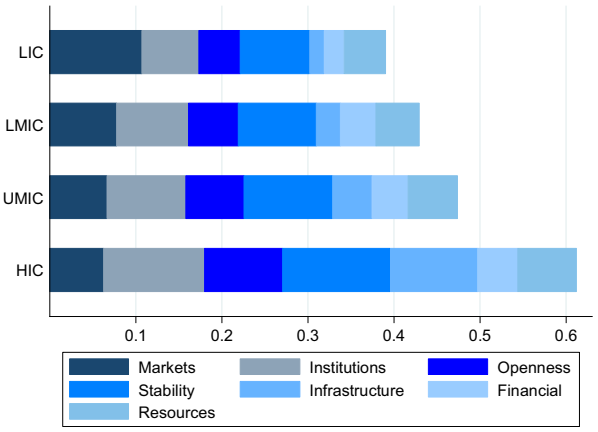

Fig. 2 DEA input index by income group, 2015–2018. Depicted values are normalized and aggregated as described in Sect. 2. The sample consists of 135 countries. Source: Authors' illustration based on the variables and data sources described in Table 1

that these countries are not necessarily less efficient in mobilizing private capital given the limited resources available to them. In order to examine whether (and to what extent) this is indeed the case, we now turn to the results of the frontier analysis.

4.2 Frontier Analysis

Based on the input and output variables described in Sect. 2, the frontier estimated through DEA captures the potential level of private capital flows as a function of the quality of a country's domestic enabling environment. Importantly, the point on the frontier that is used to assess the performance of a given country is determined by a subset of countries in the sample with similar enabling factors as the considered unit (recall the discussion in Sect. 1). DEA thus allows us to identify those countries that, relative to other countries facing similar domestic economic conditions, are achieving relatively high capital flows, and those countries that are apparently falling short of their potential.

Figure 3 plots aggregate private capital flows over the composite measure of countries' domestic enabling environment for the periods 2007–2011 and 2015–2018, and shows the respective production possibility frontier (dotted line) for private capital mobilization. For the considered sample of 135 countries, the frontier in 2015–2018 turns out to be determined by three countries. At the lower end of the DEA input index, the frontier is defined by Yemen, which during this time period featured the weakest domestic environment among all included countries. In the middle of the sample, the frontier is defined by South Africa, which outperforms many countries with comparable domestic environments. At the upper end, the frontier is defined by the Netherlands, which features both the highest level of private capital flows and one of the strongest domestic environments in the sample. The efficiency scores associated with the estimated frontier in 2015–2018 range from 0.39 (Mongolia) to 1 (the three countries located on the frontier), with an average score of 0.62. This suggests that the countries in our sample achieved about 62% of their

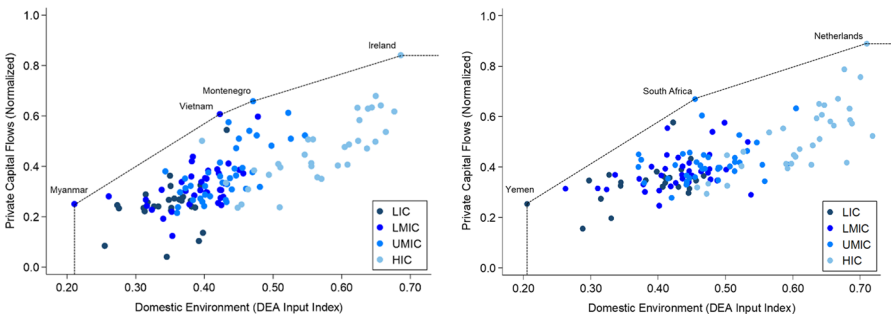

Fig. 3 Estimated frontier, 2007–2010 (left) and 2015–2018 (right). The dotted line represents the production possibility frontier for private capital mobilization (including FDI inflows, portfolio equity inflows, and private sector borrowing) as a function of countries' domestic enabling environment (proxied by the DEA input index). Values are normalized and aggregated as described in Sect. 2. The sample consists of 135 countries. Source: Authors' illustration based on the variables and data sources described in Table 1

potential levels of private capital flows in the period 2015–2018, on average (recall that efficiency scores close to one indicate that a country is generating relatively large amounts of private capital as a percentage of GDP given its domestic environment, whereas smaller scores indicate inefficiencies in private capital mobilization). Most countries feature efficiency scores between 0.5 and 0.8, suggesting that these countries achieved between 50 and 80% of their potential levels of private capital flows in the period 2015–2018.

Notice from Fig. 3 that the shape of the frontier looks relatively stable between 2007–2011 and 2015–2018. However, the countries defining the frontier differ across the two periods. Specifically, the frontier in 2007–2011 is defined by four countries, namely Myanmar, Vietnam, Montenegro, and Ireland. Most of these countries are also located close to the frontier in 2015–2018, resulting in high efficiency scores for Ireland (0.86), Vietnam (0.81), and Myanmar (0.78) in 2015–2018. In contrast, the relative efficiency of Montenegro seems to decline over time, with an efficiency score of 1 in 2007–2011 and 0.66 in 2015–2018.

Figure 4 shows box plots of the DEA efficiency scores obtained across income groups (Fig. 4A) and regions (Fig. 4B). Interestingly, these results indicate that countries with low or high performance are not concentrated in a particular income group or region. Rather, the different groupings feature strongly overlapping ranges of scores, and the median scores are relatively similar across income groups and regions (except for EAP, which features a somewhat higher median score than other regions). In addition, these results imply that when differences in economic conditions across countries are taken into account, many LICs are, in fact, more efficient in generating revenues than countries from higher income groups. This shows that accounting for differences in economic conditions via DEA leads to additional insights about countries' performance in mobilizing private capital. In particular, a simple comparison of mobilized capital flows relative to GDP suggests that LICs perform worse than countries in higher income groups (recall the results in Fig. 1).

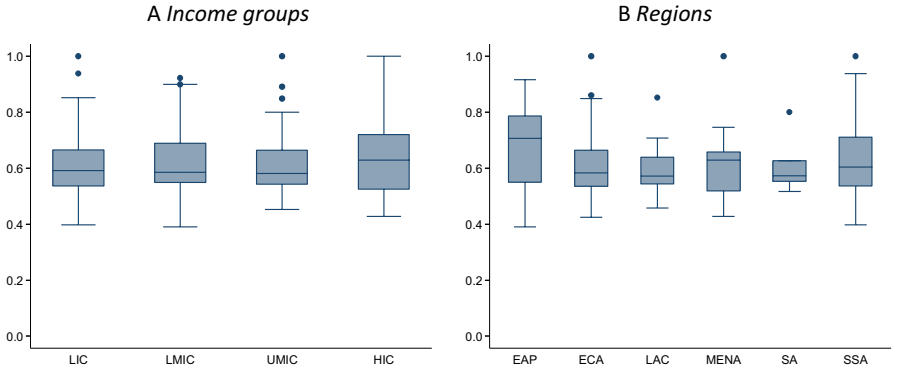

Fig. 4 Ranges of DEA scores by income group and region, 2015–2018. **A** Income groups. **B** Regions. The sample in **A** consists of 135 countries. **B** Excludes Canada and the USA. Details on the computation of the depicted DEA scores are provided in Sect. 2. Source: Authors' illustration based on the variables and data sources described in Table 1

In contrast, the DEA results reveal that there are many LICs that, in fact, perform better than countries from higher income groups given the economic resources and conditions available to them. An example is Ethiopia, a LIC, which generates much less private capital relative to GDP (captured by a normalized private capital measure of 0.37 in 2015–2018) than, for example, Montenegro (an UMIC with normalized private capital flows of 0.50). Despite its lower level of achieved private capital flows, Ethiopia is achieving 81% of its potential capital flows according to the estimated frontier, more than Montenegro (66%). The underlying reason is that Montenegro features a much more favorable domestic environment for generating private capital than Ethiopia, as captured by the large gap in the DEA input index across these two countries (0.55 in Montenegro and 0.33 in Ethiopia).

From a policy perspective, the finding that countries with large untapped potential for private capital mobilization are spread across all income groups and geographical regions also suggests that targeting development efforts towards countries with low (or high) performance in generating private capital flows would need to take into account underlying economic structures and not merely countries' broad income group or geographic region.[11]

Importantly, our analysis also generates a rich set of results on the relative performance of individual countries on each of the seven dimensions of the enabling environment. For example, the results indicate that Mongolia (the country with the largest untapped potential in 2015–2018) performed well on stability (0.84), institutional and regulatory quality (0.81), and natural and human resources (0.79). At the same time, Mongolia performed less well on market-related factors (0.48) and economic and political stability (0.52), and relatively poorly on Infrastructure (0.21) and financial development (0.11). While a comprehensive discussion of the results for all countries would go beyond the scope of this paper, this example demonstrates that the analysis can be helpful in identifying the dimensions in which each country features the strongest deficits compared to other countries, and thus where policy action might be most critical.

Trends over time Our data also allow us to track countries' relative performance in attracting private capital flows over time, by calculating the frontier separately for each of the three 4-year periods between 2007 and 2018 (the frontier for 2007–2010 is shown in the left graph in Fig. 3). Table 2 reports the results by income group and region. As shown in the last column, LICs achieved significantly higher DEA scores in the period 2015–2018 than in 2007–2010, on average, whereas the DEA scores for all other income groups increased only marginally. Consistent with this finding,

[11] One may also be interested in the factors explaining the variation in DEA efficiency scores across countries, i.e., why some countries attract higher private capital flows than other countries with comparable economic conditions. When we estimate cross-country panel regressions (including country fixed effects) for the same three 4-year periods as considered in the DEA, we find that the level of corruption is robustly correlated with higher DEA efficiency scores, while there are no significant results for tax rates, technological readiness, and foreign aid inflows. However, given the observational nature of our data, we stress that more research is needed to obtain reliable conclusions regarding the driving forces behind differences in countries' relative performance in attracting private capital flows.

Table 2 DEA results over time by income group and region

	2007–2010			2011–2014			2015–2018			Change in DEA score 2007–2018
	Private capital	Input index	DEA score	Private capital	Input index	DEA score	Private capital	Input index	DEA score	
Income group										
LIC	0.25	0.35	0.52	0.31	0.35	0.66	0.34	0.39	0.62	+0.10
LMIC	0.32	0.39	0.60	0.36	0.40	0.62	0.38	0.43	0.62	+0.02
UMIC	0.37	0.43	0.61	0.39	0.45	0.59	0.42	0.47	0.62	+0.01
HIC	0.47	0.57	0.63	0.50	0.58	0.64	0.52	0.61	0.64	+0.01
Region										
EAP	0.45	0.47	0.71	0.48	0.49	0.70	0.49	0.52	0.68	−0.03
ECA	0.43	0.50	0.63	0.44	0.52	0.61	0.46	0.55	0.61	−0.02
LAC	0.33	0.43	0.55	0.37	0.44	0.57	0.40	0.47	0.59	+0.04
MENA	0.33	0.42	0.56	0.33	0.42	0.57	0.37	0.44	0.62	+0.06
NAM	0.55	0.63	0.70	0.60	0.64	0.73	0.62	0.66	0.73	+0.03
SA	0.27	0.36	0.57	0.33	0.38	0.62	0.35	0.41	0.60	+0.03
SSA	0.29	0.37	0.55	0.35	0.38	0.66	0.37	0.41	0.63	+0.08
Average	0.36	0.44	0.59	0.39	0.45	0.62	0.42	0.48	0.62	+0.03

Changes in DEA efficiency scores over time are calculated as the difference between the score in the period 2015–2018 and the score in 2007–2010. The sample consists of 135 countries. Details on the construction of the normalized measure of private capital flows and the DEA input index as well as the computation of the DEA efficiency scores are provided in Sect. 2

the region with the largest increase in DEA scores is sub-Saharan Africa, which suggests that many (low-income) countries in this region managed to catch up with the frontier. When looking at changes in relative performance of individual countries, then Yemen (+0.46), Angola (+0.45), and Mozambique (+0.36) feature the strongest increases in DEA scores between 2007–2010 and 2015–2018. In contrast, the countries with the largest declines in DEA scores are Mongolia (−0.51), Montenegro (−0.34), and the Seychelles (−0.33). More generally, this shows that it is not the case that all countries tend to move in the same direction with little changes in their relative positions to each other. Rather, some countries appear to catch up to the frontier over time while others fall behind.

Note that there are three possible factors behind an increase in the DEA score of any given country: an increase in the country's private capital flows, a worsening of the country's domestic enabling environment (corresponding to a decline in the DEA input index), and changes in the frontier itself due to changes in the performance of other countries. A good example of the second case is Yemen, which increased its DEA score from 0.54 in 2007–2010 to 0.75 in 2011–2014 and 1.0 in 2015–2018 (on the frontier). While capital flows in Yemen remained about the same over this time (0.24 in both 2007–2010 and 2011–2014, and 0.25 in 2015–2018), the quality of the domestic environment decreased sharply, as captured by a decline in the DEA input index from 0.33 in 2007–2010 to 0.21 in 2015–2018. Together, this suggest that despite a significant deterioration in its domestic environment Yemen managed to keep capital flows at a similar level, and consequently the DEA scores of Yemen increased. However, the case of Yemen seems to be an exception. For all other LICs with increases in DEA scores, these increases appear to be due to improvements in private capital flows or changes in the frontier rather than declines in the quality of the domestic environment.[12]

As can also be seen in Table 2, EAP and ECA are the only regions with a negative trend in DEA scores over time, despite increases in their measure of private capital flows. The declines in the DEA scores for these two regions are thus either driven by the improvements in their domestic environment between 2007 and 2018 or by changes in the frontier (or a combination of both). For all other regions, both the DEA scores and the normalized measure of private capital flows as well as the proxy of the domestic environment show positive trends over time.

It should be noted that the frontier analysis is designed to track countries' *relative* performance within the sample (i.e., in comparison to other countries during the same time period) rather than countries' absolute performance over time. This

[12] One may be worried that the results are driven by the special case of Yemen ("outlier"). However, notice from Fig. 3 that excluding Yemen would have only a very small effect on the frontier and resulting efficiency estimates. Specifically, without Yemen the lower end of the frontier would be defined by Angola (a LMIC, corresponding to the data point closest to Yemen in Fig. 3). Since Angola was already located very close to the frontier (with a DEA efficiency score of 0.9), dropping Yemen would only lead to a minor downward rotation of the first segment of the frontier (previously defined by Yemen and South Africa), resulting in small increases in the efficiency scores of countries with lower values of the DEA input index than South Africa, and no changes for countries with values of the DEA input index above the one of South Africa.

means that the DEA scores (as well as the values of the input index) cannot be directly compared across time. Instead, similar scores in two periods indicate that the relative performance of a country within the sample remained about the same.[13]

5 Robustness

The construction of the composite measures of private capital flows and domestic enabling environment involve several decisions about the applied aggregation methodology which may affect our results. This section explores the robustness of our findings to alternative specifications and different weighting schemes.

Our measure of private capital flows (DEA output variable) aggregates information on three types of capital flows (FDI, portfolio equity, and private sector borrowing). For the baseline measure used in the analysis above each of these variables carries an equal weight. We test the robustness of our results to three alternative weighting schemes, where each scheme assigns double weight to one particular type of capital flow (this approach mirrors the robustness checks with respect to weighting in Afonso et al. 2005). For example, one alternative specification assigns a weight of 1/2 to FDI, while the indicators for the other two capital flows are assigned a weight of 1/4 each. The other two alternative specifications assign a weight of 1/2 to portfolio equity and to private sector borrowing, and 1/4 to the other two types of capital, respectively. To assess the similarity of the resulting outcomes with our baseline specification, we calculate two sets of correlation coefficients. The first set consists of standard Pearson correlation coefficients for continuous variables. These are used to test the similarity between the resulting values under alternative weighting schemes with those of the baseline measure. Second, we calculate Spearman correlation coefficients which measure the similarity between discrete rankings. The Spearman correlation coefficient ranges inside the interval [− 1,1] and takes the value 1 if the two rankings are identical whereas values smaller than 1 indicate less agreement (a value of 0 indicates that the rankings are completely independent and a value of -1 indicates that one ranking is the reverse of the other). These are used to assess the similarity between the resulting rankings of countries rather than the associated absolute values. In total, we calculate 18 correlation coefficients: two coefficients for each of the three weighting specifications in each of the three time periods. In all these cases, the correlation between our baseline measure and a given alternative specification is at least 90% and is always significant at the 1%

[13] This approach has the advantage that it controls for general time effects, i.e., events that affect all countries simultaneously in a given period. For example, suppose country A achieves an efficiency score of 0.4 in the first period and 0.5 in the second period. It might be the case that private capital flows (relative to GDP) in fact declined from the first to the second period. This might be the case if a global shock, such as the Financial Crisis, negatively affected private capital mobilization in all countries, but country A managed to cope with the shock relatively better than other countries. In this case, country A would have improved its performance relative to the other countries in the sample despite an absolute decline in its level of private capital flows (relative to GDP).

significance level. This suggests that our main results are robust against moderate changes in the underlying weighting scheme for our measure of private capital flows.

The measure of the domestic enabling environment (DEA input variable) aggregates information on 14 indicators spanning seven dimensions (see Table 1). With so many variables involved, it is unlikely that alternative weighting schemes that assign double weights on one particular indicator or dimension will have a relevant effect on the final outcome. Instead, we test the robustness of the results to alternative specifications that drop one of the dimensions entirely. For this purpose, we construct seven alternative composite indices for each of the three time periods, in each case dropping one of the seven dimensions included in the baseline measure. In addition, we construct another alternative measure based on principal component analysis (PCA), where the weights for each dimension are based on the results of the PCA. In total, we construct 24 alternative specifications across the three time periods, leading to 48 correlation coefficients. Similar to above, the Pearson correlation coefficients between our baseline measure of the domestic environment and any given alternative specification is never below 90% and is always significant at the 1% significance level. The same holds for the Spearman correlation coefficients when comparing the rankings of countries resulting from the alternative specifications with the ranking associated with our baseline measure. In particular, this suggests that our results are not driven by a single factor or dimension in the composite measure of the domestic enabling environment.

Despite the apparent robustness of the results to moderate changes in the specifications and procedures used to construct the variables included in the DEA, we stress that all our quantitative results should be interpreted with caution, as data quality for the used indicators is limited. In particular, it should be noted that the variables used in the DEA provide only rough approximations of the aggregate private capital flows and domestic enabling environment in each country, and thus the precision of the efficiency score estimates is limited. We therefore suggest that the reported estimates should be seen as suggestive evidence of the relative performance and magnitudes of untapped potential in attracting private capital flows, and stress that more empirical research to investigate possibilities for scaling up private capital mobilization and guide policy decisions in this context is warranted.

6 Conclusion

Allocating scarce development funds in optimal ways to leverage private capital requires policymakers to know not only the achieved levels of private capital flows in each country but also which countries are already performing close to their limit, and which countries still feature large untapped potential for further increasing private capital flows. This paper proposes the use of non-parametric data envelopment analysis to estimate the empirical production possibility frontier for private capital mobilization as a function of countries' domestic enabling environment, and quantify each country's performance relative to its estimated potential.

Our analysis confirms the findings of previous studies (e.g., those listed in Table 3) that richer countries tend to feature more favorable conditions for attracting private

capital flows. Many of these countries also perform well relative to their good conditions, e.g., the Netherlands (a HIC) and South Africa (an UMIC) are both estimated to operate on the efficiency frontier for private capital mobilization. At the same time, our results also reveal that many low-income countries, particularly in Africa and South Asia, which do not rank high according to achieved levels of private capital flows relative to GDP, are in fact performing on or very close to the frontier, which indicates that these countries are good performers given the resources available to them. This suggests that commonly used measures of achieved levels of private capital mobilization, such as the shares of foreign direct and portfolio investment in GDP, are poor indicators of the degree of efficiency with which countries manage to attract private capital flows given their domestic conditions and constraints.

The results of our DEA suggest that the levels of private capital flows in the 135 countries in our sample were at 62% of the estimated potential, on average, in the period 2015–2018. When tracking the performance of countries and regions over time, we find that most regions show positive trends in attracting private capital relative to their enabling environment. Sub-Saharan Africa experienced the strongest increase in efficiency scores between 2007 and 2018, indicating that various countries in this region are catching up with the frontier. At the same time, this also implies that it will become more difficult for these countries to further increase private capital flows unless there are significant improvements in their domestic enabling conditions.

From a policy perspective, the finding that countries with large untapped potential for private capital mobilization are spread across all income groups and geographical regions suggests that targeting development efforts towards countries with low (or high) performance in generating private capital flows would need to take into account underlying economic structures and not merely countries' broad income group or geographic region. The proposed DEA approach also generates a rich set of results for individual countries, including the relative performance of countries on each of the seven dimensions of the enabling environment. For example, these results may be helpful in guiding reform priorities aimed at increasing countries' private capital flows through improvements in their enabling environments, by identifying the dimensions in which each country features the strongest deficits compared to other countries. At the same time, we stress that more research is needed to obtain reliable conclusions regarding the performance (and determinants) of countries' private capital mobilization efforts, and guide policy decisions. The non-parametric frontier approach proposed in this paper may provide a useful point of departure for future work in this direction.

Appendix

Appendix A. Structured literature review

The composite measure of countries' domestic enabling environment for private capital mobilization (DEA input index) constructed in Sect. 2 aggregates information from 14 empirical indicators that have been identified in the economic literature as important determinants of private capital flows. The selection of variables

included in this composite measure is based on a structured literature review using the following procedure:

1. Two independent keyword searches are performed using Google Scholar (GS) and Web of Science (WoS) with the following parameters:
   - Keywords: "determinants capital flows developing countries"
   - Timespan: since 2000
   - Additional settings: only articles (no patents, etc.); only economics database (WoS)
   - Sorting of results: by relevance (GS); by times cited (WoS)
2. The first 20 articles from each search are reviewed in detail and further considered if they provide information about (i) FDI, portfolio flows, or private sector borrowing (e.g., excluding articles focused on remittances), (ii) empirical determinants (not purely theoretical), and (iii) domestic pull factors in the host country (not focused exclusively on foreign push factors). There are 16 articles which meet these criteria. Table 3 provides a list of these articles and shows which factors are considered in each study to explain private capital flows. The roman numerals in Table 3 indicate the corresponding dimension of each factor in the DEA input index (see Table 1) and the signs in parentheses indicate the estimated direction of the relationship between each factor and private capital flows, where (+) indicates a positive relationship, (−) indicates a negative relationship, and (0) indicates a statistically insignificant relationship.
3. Finally, the variables used in the construction of the DEA input index are selected to match the factors that are found to be significantly related to private capital flows in a majority of the articles listed in Table 3, conditional on data availability for our sample and covered time period.

Table 3 Structured literature review

Authors (year)	Factors considered to explain private capital flows (sign of direction)
Addison and Heshmati (2003)	I: (+) GDP; (+) real annual interest rate; (−) Investment risk (interest rate spread); (+) GDP growth; II: (+) trade (% of GDP); III: (+) indicators of political stability; IV: (0) inflation; V: (0) phones per 1000 people; (+) spending on ICT (% of GDP); VII: (+) exporter of fuel, ores, or metals; (+) secondary school enrollment; (0) wages; other: (0) government consumption (% of GDP); (−) manufacturing share in GDP; (−) public debt
Ahlquist (2006)	I: (0) GDP; (+) GDP per capita; III: (+) indicators of political stability; IV: (0) inflation; (0) government budget deficit; (0) fluctuations in GDP growth; other: (+) government consumption (% of GDP)
Ahmed and Zlate (2014)	I: (+) interest rate differentials; (+) GDP growth differentials
Aleksynska and Havrylchyk (2013)	I: (+) GDP; (0) GDP per capita differentials; III: (-) indicators of institutional quality; VII: (+) subsoil resources per capita; (0) years of schooling; Other: (0) government consumption (% of GDP); (−) distance; (+) adjacency; (+) common language

Table 3 (continued)

Authors (year)	Factors considered to explain private capital flows (sign of direction)
Asiedu (2002)	I: (+) inverse of real GDP per capita; (0) GDP growth rate; II: (+) trade (% of GDP); III: (0) indicator of political risk; IV: (0) inflation; V: (+) phones per 1000 people; VI: (0) financial depth (ratio of M2 to GDP); other: (0) government consumption (% of GDP)
Asiedu and Lien (2004)	I: (−) GDP per capita; (0) GDP growth rate; II: (+) trade (% of GDP); III: (-) indicator of political instability; V: (+) phones per 1,000 people; (+) fixed domestic investment (% of GDP); VII: (−) share of oil in total exports; other: (−) indicators of capital controls
Bandelj (2009)	I: (+) population size; (0) GPD per capita; III: (+) institutional and regulatory environment for FDI; (0) democratization; (0) left government; IV: (−) inflation; Other: (−) Labor share in agriculture; (+) political support for FDI; (0) EU agreement; (0) IMF program
Bénassy-Quéré et al. (2007)	I: (+) GDP; (+) GDP per capita; III: (+) indicators of institutional quality; other: (−) geographical distance; (+) adjacency; (+) common language
Buckley et al. (2010)	I: (+) GDP; (0) annual patent registrations; II: (0) inward FDI stock (% of GDP); III: (+) indicator of political risk; (+) policy liberalization; IV: (+) inflation; VII: (+) ore and metal exports (% of merchandise exports); other: (−) geographical distance; (+) cultural proximity
Busse et al. (2010)	I: (+) GDP; (+) GDP per capita differentials; (+) GDP growth rate; II: (0) Trade (% of GDP); III: (+) indicator of institutional quality; IV: (0) inflation; other: (+) bilateral investment treaty; (0) double taxation treaty; (0) regional trade agreement
Dasgupta and Ratha (2000)	I: (+) GNP per capita; (+) GDP growth rate; other: (+) current account deficit; (+) World Bank lending commitments
Demirhan and Masca (2008)	I: (+) GDP per capita growth rate; II: (+) trade (% of GDP); III: (0) indicator of political risk; IV: (−) inflation; V: (+) phones per 1000 people; VII: (0) labor cost in manufacturing; other: (−) corporate top tax rate
Globerman and Shapiro (2002)	III: (+) indicators of institutional quality; VII: (0) human development index; other: (0) environmental sustainability index
Noorbakhsh et al. (2001)	I: (+) GDP growth rate; II: (+) trade (% of GDP); VI: (+) domestic credit to the private sector (% of GDP); VII: (+) secondary school enrollment; (0) wages; other: (−) net energy imports (% of energy use); (+) growth rate of labor force
Portes and Rey (2005)	I: (+) GDP; VI: (+) indicator of financial market sophistication; other: (−) geographical distance; (0) adjacency; (+) common language; (+) number of bank branches
Tobin and Rose-Ackerman (2011)	I: (+) Population size; (+) GDP per capita; (+) GDP per capita growth rate; II: (+) trade (% of GDP); III: (+) indicators of political environment for investment; VII: (0) exporter of natural fuels and ores; other: (+) bilateral investment treaty

(+) = positively related to capital inflows, (−) = negatively related to capital inflows, (0) = not significant

Appendix B. Data coverage and handling of missing values

In order to minimize potential biases from incomplete data, some attempts were made to impute missing values. There are two reasons why data are missing in our sample. First, values for individual country-year observations are missing for some indicators. In these cases, we augment the data with information from other years, i.e., we impute missing values for a given 4-year period with the value of the nearest period available (if any). Second, some of the datasets we use do not include all the countries in our sample. A list of the affected countries and indicators is provided in Table 4. As can be seen in the table, there are 10 countries without data on portfolio equity investment, and two of these countries also lack data on domestic credit. In these cases, our measure of aggregate private capital flows is constructed based only on those types of capital flows for which data is available for a given country (i.e., based on FDI and domestic credit, or FDI only). Analogously, in the two cases where data on infrastructure (Dimension V) and financial development (Dimension VI) is missing, the DEA input index (domestic enabling environment) is based on the subset of factors for which data are available.

Table 4 Missing data

Country	FDI	Portfolio equity	Domestic credit	Domestic enabling environment						
				I	II	III	IV	V	VI	VII
Central African Rep		X								
Chad		X								
Djibouti		X								
Honduras		X								
Kosovo								X		
Nepal		X								
Saudi Arabia		X								
St. Lucia		X								
Turkmenistan		X	X						X	
United Arab Emirates		X								
Uzbekistan		X	X							

"X" indicates that data on the indicator are missing for the respective country

Table 5 List of countries by income group

LIC	LMIC	UMI	HIC
Afghanistan	Angola	Albania	Argentina
Benin	Bangladesh	Algeria	Australia
Burkina Faso	Bhutan	Armenia	Austria
Burundi	Bolivia	Azerbaijan	Belgium
Central African Republic	Cambodia	Belarus	Canada
Chad	Cameroon	Bosnia and Herzegovina	Chile
Congo, Dem. Rep	Congo, Rep	Botswana	Croatia
Ethiopia	Côte d'Ivoire	Brazil	Denmark
Guinea	Djibouti	Bulgaria	Finland
Guinea-Bissau	Egypt, Arab Rep	China	France
Haiti	El Salvador	Colombia	Germany
Liberia	Georgia	Costa Rica	Hungary
Madagascar	Ghana	Dominican Republic	Ireland
Malawi	Honduras	Ecuador	Italy
Mali	India	Gabon	Japan
Mozambique	Indonesia	Guatemala	Latvia
Nepal	Kenya	Guyana	Netherlands
Niger	Kosovo	Iraq	New Zealand
Rwanda	Kyrgyz Republic	Jamaica	Norway
Senegal	Mauritania	Jordan	Oman
Sierra Leone	Moldova	Kazakhstan	Panama
Tajikistan	Mongolia	Lebanon	Poland
Tanzania	Morocco	Libya	Qatar
Togo	Myanmar	Macedonia, FYR	Saudi Arabia
Uganda	Nicaragua	Maldives	Seychelles
Yemen, Rep	Nigeria	Mauritius	Singapore
	Pakistan	Mexico	Sweden
	West Bank and Gaza	Montenegro	Switzerland
	Papua New Guinea	Namibia	Trinidad and Tobago
	Philippines	Paraguay	United Arab Emirates
	Solomon Islands	Peru	UK
	Sri Lanka	Romania	Uruguay
	Tunisia	Russian Federation	USA
	Ukraine	Serbia	
	Uzbekistan	South Africa	
	Vietnam	St. Lucia	
	Zambia	Thailand	
		Turkey	
		Turkmenistan	

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