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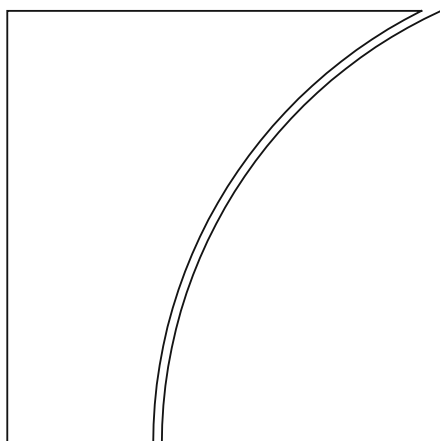
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Keywords: environmental factors, capital flows,
emerging markets, energy mix.



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Environmental factors and capital flows to emerging markets

Jose Aurazo, Rafael Guerra, Pablo Tomasini, Alexandre Tombini and Christian Upper¹

Abstract

This paper examines the impact of environmental factors on international capital flows – specifically portfolio, bank, and foreign direct investment (FDI) inflows – to emerging market economies (EMEs). Using two complementary approaches, we first analyse how recipient country factors influence capital flows for 21 EMEs, finding that EMEs with lower exposure to extreme weather events, a greener energy mix, more and stronger climate-related policies tend to attract greater capital inflows. Second, using bilateral data for FDI and bank flows, we explore the role of sending country factors (advanced economies, AEs) in determining capital inflows to EMEs. The results suggest that stricter environmental regulations in AEs lead to increased capital inflows to EMEs with weaker green regulations. This suggests an “emission shifting” effect. At the same time, though, they also route more investment to EMEs with a greener energy mix. These findings underscore the significance of environmental factors in shaping international capital flows.

Keywords: environmental factors, capital flows, emerging markets, energy mix.

JEL classification: F21, F23, F64.

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1. Introduction

Environmental considerations – covering climate-related issues, pollution and the destruction of habitats – are likely to play a growing role in public and private sector capital allocation in the coming years. Some activities will become more expensive or simply unfeasible whereas others will gain importance. This will change the risk-return profile of many assets, which should affect capital allocation both within and between countries.

Emerging market economies (EMEs) have historically attracted significant capital flows due to their growth potential, fuelled by industrialisation, urbanisation, competitive markets and higher return rates. However, these flows have often been volatile, sensitive to both global financial conditions and domestic macroeconomic policies. In recent years, environmental considerations have begun to significantly influence the macroeconomic outlook. Notably, the Paris Agreement marked a turning point, as most EMEs committed to reducing greenhouse gas emissions, prompting the adoption of environmental policies. At the same time, investors have increasingly aligned their strategies with these environmentally friendly objectives, further reshaping capital flows by directing resources towards sustainable investments.

This paper aims to examine how environmental factors affect capital flows to EMEs. In particular, physical and transition risks,² along with the energy mix (a factor not explored before in the international finance literature), might have played a pivotal role in reshaping capital allocation to EMEs in recent years.

Since some channels through which environmental factors affect capital flows work exclusively through the receiving country whereas others depend on both receiving and sending country characteristics, we undertake two empirical exercises.

The first focuses on the *receiving* country, where we study different types of capital inflows (ie foreign direct investment (FDI), portfolio investment and bank lending) can be affected by environmental factors, based on a panel of 21 EMEs covering the period from 1996 to 2023.

Our results suggest that EMEs less exposed to extreme weather events, with a higher share of renewables in their energy mix and more stringent climate-related policies receive more foreign capital than others. The results vary across type of flows. Extreme weather events (the number of events or the caused damage) decrease the three types of capital flows. A greener energy mix boosts FDI and portfolio investment but does not affect cross-border bank lending. Stricter climate-related policies in the receiving country are associated with higher FDI and portfolio investment but have no apparent effect on bank flows.

Some of the results also vary over time. While the impact of physical risk on capital flows holds for the entire sample, a greener energy mix only has a positive impact on flows after the Paris Agreement came into effect in 2016. This could be

² *Physical risk* refers to damage and disruption from extreme weather events and other climate or environment-related phenomena, leading to economic losses and reduced investor confidence. *Transition risk* arises from adjusting to a lower-carbon economy, driven by climate awareness and regulatory actions.

because, unlike the earlier Tokyo Protocol, the Paris Agreement committed EMEs to reducing their carbon emissions.

Our second approach examines how factors in *sending* countries influence capital flows and how they interact with *receiving* country characteristics. This broader perspective acknowledges that capital allocation is shaped not only by conditions in destination countries of financial flows but also by those in origin countries. This analysis examines bilateral FDI and bank flows³ from 19 advanced economies (AEs) to 21 EMEs over the period 2010–2023.

The results complement and extend the findings of the first approach. Specifically, we observe two key patterns. First, stricter environmental regulations in AEs are consistently associated with greater FDI and bilateral bank inflows to EMEs, particular those with fewer or less stringent environmental regulations – an effect we term “emission shifting”. Second, EMEs with a greener energy mix attract greater FDI and bank flows from AEs with stringent environmental regulations.

The literature of environmental factors playing a role in international capital flows is relatively new. Gu and Hale (2023) and Pienknagura (2024) explore how environmental factors affect FDI. Gu and Hale estimate whether FDI reacts to physical and transition risks. They do not find much impact of either the number of extreme weather events or climate change policies (as proxies for physical and transition risk, respectively) in the aggregate data, although they do obtain some significance at more granular levels and after the Paris Agreement accord. Pienknagura (2024) reports that climate policies in the recipient country can boost “green” FDI in a large sample of countries, especially in EMEs, while having virtually no effect on the remaining “brown” inflows. In a box in the ECB’s Economic Bulletin, Longaric et al (2024) show that a rise of carbon prices in Europe is associated with a decline in inward FDI. There is also a larger literature on how climate policies in the source country affect FDI.⁴

The evidence on bank lending is mixed (Aiello (2024), Degryse et al. (2023), Demetriades and Politsidis (2025),⁵ Erten and Ongena (2023), and Gambacorta et al. (2023), Gu et al (2025),⁶ Sastri, Verner and Marquez-Ibanez (2024)). Additionally, Kacperczyk and Peydró (2022) found that banks lend less to firms with high carbon emissions but are more willing to lend to high-emission firms with ambitious reduction targets.

To the best of our knowledge, this is the first paper to consider how the energy mix, in addition to physical and transition risks affects capital flows to EMEs. Previous papers limit their analysis to FDI or bank lending and consider fewer or different environmental variables. Also, we have not found any paper that discuss the effect of

³ We do not use bilateral portfolio investment data, since the presence of financial centres through which a large part of these flows are routed makes it hard to identify the origin country.

⁴ For example, Ben David et al (2021) and Koch and Mama (2019) find some evidence of leakage from the European Union’s Emissions Trading System, although the magnitudes are relatively limited.

⁵ They find that banks, especially those committed to ESG goals, charge higher rates on syndicated loans to firms producing fossil fuels compared to other firms, although they continue to lend heavily to them.

⁶ They find that banks do not lend more to green than to brown firms, although within high-emission sectors they tilt their credit allocation towards greener sectors.

environmental factors on portfolio investment. Finally, we go deeper into mechanisms through which these factors may influence and adjust capital inflows to EMEs.⁷

The paper is structured as follows. Section 2 discusses the potential mechanisms through which environmental factors may affect capital flows. Section 3 presents our data and empirical strategy. Section 4 presents the results. The final section concludes and draws some policy implications.

2. Potential mechanisms

Environmental factors can affect capital flows through a variety of channels. First, physical risks and environmental degradation may damage assets, increase costs, or render some activities less profitable, thereby deterring investment. Second, policies and regulations aimed at addressing environmental degradation and climate change can significantly influence capital flows. Finally, preferences for green energy, aligned with global energy transition goals, could create another channel, as the growing demand for environmentally responsible investments drives capital towards sustainable sectors, projects, and countries.

2.1 Physical risk channel

The globe is warming, and extreme weather events are becoming more common (Graph 1.A). Many EMEs, especially in Asia and Latin America, are strongly exposed to physical risks. For example, many Asian economic centres are close to the coast and prone to flooding. Building dykes or relocating activities will increase production costs and may not always be feasible. Most EMEs are in the hot regions of the globe, so further increases in temperatures can lower agricultural yields, increase cooling costs and reduce productivity of outdoor activities (Graph 1.B). At the same time, environmental degradation and physical risk may spur the demand for some goods and services. Global warming may also benefit some regions, even if the global effects are negative.

Physical risks can affect foreign investment in at least two ways. First, extreme weather events and environmental disasters boost FDI if firms rebuild destroyed capital or undertake investment to increase the resilience of existing capital. Similarly, they may boost portfolio or bank lending as domestic firms or the government borrow abroad to finance rebuilding. Second, an increase in the number of extreme weather events may destroy capital due to the damage caused and discourage future

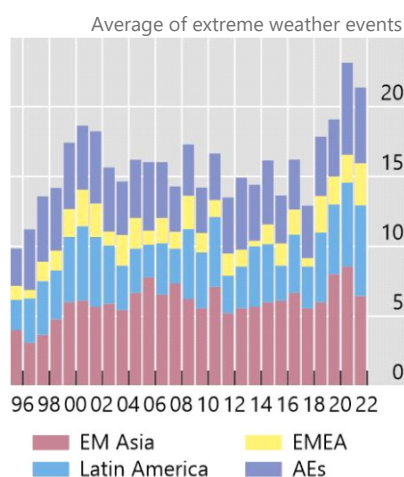
⁷ There is also literature finding that environmental factors and policies affect asset prices. The surveys by Eren et al (2022) and De Bandt (2023) find evidence for financial markets and banks pricing climate-related risks. That said, the size of the price effects (*greenium*) is generally quite small and, given the absence of accepted benchmarks it is unclear whether it does capture the full amount of risk. Gormsen et al (2024) show that firms' perceived cost of capital, extracted from earnings calls, was about one percentage point lower for "green" firms than for "brown" firms. This discrepancy had real effects, as firms that perceived this differential as large pledged larger emission reductions than those that believed it to be small. Some large firms also used lower discount rates for their green operations than for their brown operations.

investment flows (Graph 1.C). Both effects offset each other, making it an empirical question as to which one dominates.

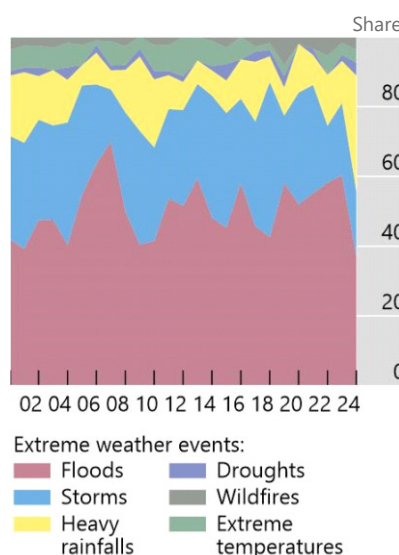
Physical risks have become more important

Graph 1

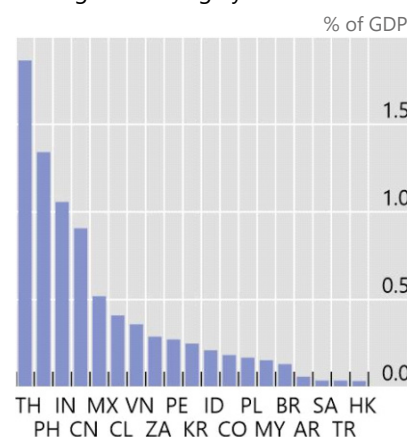
A. Extreme weather events become more common¹



B. Floods, storms and heavy rainfall dominate the weather events



C. Extreme weather events cause damage that is highly variable²



¹ Climatological, hydrological and meteorological events that caused ten or more deaths. ² Average figures between 2000–24.

Sources: CRED, EM-DAT; Authors' calculations.

2.2 Environmental regulation channel

Climate-related policies have gained importance, initially in AEs but increasingly in EMEs, in terms of both the number of announced policies and levels of stringency (Graphs 2.A and 2.B). These policies take a wide variety of forms, ranging from outright prohibitions of certain activities to quantity ceilings, taxes on specific emissions and emissions reporting requirements.

In contrast to the long-standing impact of physical risks, the effects of environmental policies, particularly those aimed at combating climate change, are likely to have become relevant only in more recent years. While AEs committed to reducing greenhouse gas emissions in the Kyoto Protocol of 2005, such policies only became widespread after the 2016 Paris Agreement, which entails much more wide-ranging commitments. Unlike the Kyoto Protocol, the Paris Agreement also included significant commitments from EMEs to reduce greenhouse gas emissions, leading to the adoption of environmental policies by these countries (Graph 2.C).

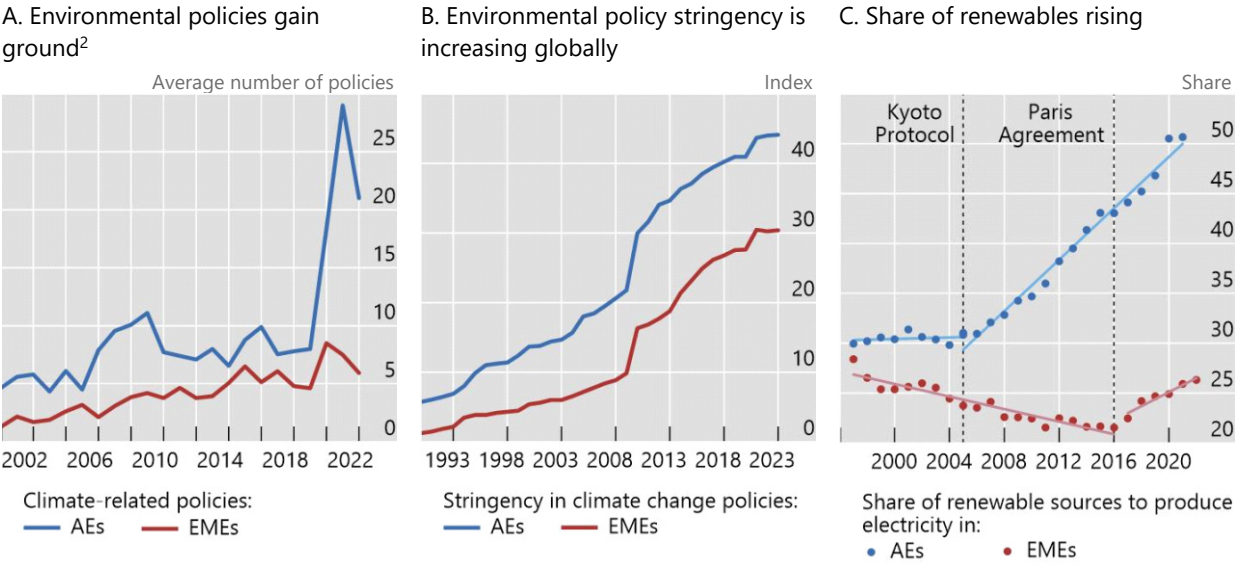
The impact on capital flows of environmental policies in the receiving country can be ambiguous. On the one hand, more or more stringent regulation could reduce risk and serve as a seal of approval, thus helping attract capital inflows. On the other hand, it could increase the costs of doing business and thus deter foreign investment.

Regulation in sending countries could also influence capital flows, often in interaction with the context of the receiving country. For example, firms in sending countries with stricter standards may offshore polluting activities to EMEs with laxer

policies (the “emission-shifting” effect). Conversely, investors in sending countries may prefer to invest in countries with a higher level of green regulation (the “seal of approval” channel).

Environmental regulation and green energy mix gain ground¹

Graph 2



¹ Simple mean across AEs and EMEs. ² Policies in force or announced since 2000.

Sources: Nachtigall et al (2025); IEA; Authors’ calculations.

2.3 Energy mix channel

The Kyoto and Paris agreements were also followed by a sharp rise in the share of renewables in the energy mix of AEs and EMEs, respectively. Since Paris, the share of renewables in electricity generation in EMEs rose by some five percentage points to 27%, although this remains considerably below the 50% achieved in AEs (Graph 2.C).

A higher share of energy generated from renewables in the receiving country could help attract capital since it would allow foreign investors or lenders meet potential emission goals. We would expect this effect to be stronger for sending countries with high levels of environmental regulation than those with low regulation, denoting a larger presence of investors following environmental goals.

Even though increasing the share of green energy may entail trade-offs for many EMEs in the long term (Americo et al (2023)), it is worth studying its effects on international finance in the short- and medium-term.

2.4 Testable hypotheses

Based on the discussion above, we summarise the following testable hypotheses for each channel:

i) **Physical risk channel**

- An increase in the number or severity of extreme weather events in receiving countries may reduce the attractiveness and hence decrease the volume of foreign investment (discouragement effect).
- An increase in the number or severity of extreme weather events in receiving countries may require increased reconstruction and adaptation investment and hence boosts capital inflows to EMEs (reconstruction investment effect).

ii) **Environmental regulation channel**

- Stricter environmental regulations in receiving countries may boost foreign investment by signalling credibility and sustainability.
- Stricter environmental regulations in receiving countries may deter foreign investment by increasing the cost of doing business.
- Stricter regulation in sending countries may boost foreign investment to EMEs with high levels of green regulation, as these countries are perceived as more sustainable (seal of approval effect).
- Stricter regulation in sending countries may increase foreign investment inflows to EMEs with low levels of green regulation, as firms seek to avoid stringent environmental standards (emission shifting mechanism).

iii) **Energy mix channel**

- A higher share of the use of renewable sources in the energy mix in the receiving country may raise capital inflows.
- Stricter environmental regulations in sending countries may boost foreign investment to EMEs with a greener energy mix.

3. Database and empirical strategy

To test the above hypotheses, it is important to first recognise that some are driven solely by factors in receiving countries, while others rely on the interaction between factors in both receiving and sending countries. This distinction necessitates the use of different approaches. Before delving into the details of our empirical methodology and the two approaches adopted, we begin by providing a description of our database.

3.1 Database

Our sample comprises 21 EMEs⁸ (receiving countries) and 19 AEs⁹ (sending countries), covering the period from Q1 1996 to Q4 2023, when data is available. The database contains information on different types of capital inflows to EMEs, environmental factors for both receiving and sending countries and domestic variables as controls.

The primary focus of our study is on capital flows, sourced from three databases. First, the IMF Balance of Payments Statistics provides quarterly data on non-resident capital inflows to EMEs, disaggregated into FDI, portfolio inflows, and bank inflows,¹⁰ which we express as percentages of GDP. Second, the IMF Coordinated Direct Investment Survey database provides annual bilateral FDI flows from AEs to EMEs for the period 2009 to 2023. And third, we use quarterly bilateral bank inflows from the BIS Consolidated Banking Statistics (CBS). To avoid unreasonable ratios for some pairs of flows where units are quite small compared to GDP figures, we consider the log change of bilateral FDI and bank flows, rather than the ratio to receiving or sending country GDP. In addition, our dataset includes traditional pull factors that influence capital flows to EMEs, such as policy rates, government debt (as a percentage of GDP), GDP growth expectations, and equity market volatility. We use these pull factors for both empirical approaches, adding domestic controls for both receiving and sending countries when applicable.

The environmental factors considered in this paper include physical risks, transition risks and the use of green energies. To measure the impact of physical risks, we use the country-level standard deviation of the number of extreme weather events¹¹ and the damage caused by such events as a percentage of GDP.¹² For transition risks, we use two metrics: number of climate-related policies¹³ and the stringency of environmental policies,¹⁴ both expressed as the deviation from the country-specific trend. Finally, to test our hypothesis that the greenness of the energy matrix in EMEs helps attract capital inflows, we use the share of renewable, brown and

⁸ Argentina, Brazil, Chile, China, Colombia, Hong Kong, India, Indonesia, Korea, Malaysia, Mexico, Peru, the Philippines, Poland, Saudi Arabia, Singapore, South Africa, Thailand, Türkiye, United Arab Emirates and Vietnam.

⁹ Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Switzerland, the United Kingdom, and the United States.

¹⁰ We use "other flows" as a proxy for cross-border bank loans, as these tend to constitute the bulk of investment flows within this category.

¹¹ Following the methodology of Gu and Hale (2023), an extreme weather event is defined as one that results in ten or more fatalities in the receiving country. The data is from EM-DAT, The International Disaster Database.

¹² Ehlers et al (2025) found that extreme weather events have a significant impact, particularly when measured by the cost of the damage they cause to an economy. Accordingly, we use both metrics in this paper.

¹³ The data is from the International Energy Agency's (IEA) policies database, which covers the description of the policy, the year of implementation, status, and jurisdiction.

¹⁴ Nachtigall et al (2024) propose an environmental policy stringency measurement, defined as the degree in which policies incentive emission reduction. This measurement tracks 130 policy variables, aggregated into 56 key climate actions and policies. For this paper, we will aggregate the policy groups by obtaining a simple average.

nuclear energy in electricity generation, as reported by the IEA. All variables, except those related to the energy mix and the damage caused, are normalised to have a mean of zero and a standard deviation of one.¹⁵

Table 1 provides a summary of main descriptive statistics of the key variables for EMEs.

Summary statistics for EMEs under the receiving country approach

Table 1

	Observations	Mean	Std dev	Min	Max
Extreme weather events (# events)	2,000	3.4	4.6	0	26
Damage cost of extreme weather events (% GDP)	1,874	0.1	1.1	0	42.5
Use of renewable energy to produce electricity (%)	2,296	25.2	25.8	0	93.6
Use of brown energy to produce electricity (%)	2,296	72.1	25.5	5.6	100
Use of nuclear energy to produce electricity (%)	2,296	2.7	7.1	1	42.7
Climate-related policies implemented (# policies)	1,808	4.8	4.7	1	29
Stringency in environmental policies (standardised)	1,456	0	1	-2.1	4.6
Portfolio flows (% of GDP)	1,764	1.3	3.3	-24.6	37.4
Bank flows (% of GDP)	2,053	0.8	3.3	-35.3	19.2
FDI flows (% of GDP)	2,061	2.5	2.5	-8.3	36.2
Nominal monetary policy rate (%)	2,189	7.9	9.7	0.5	126.2
Government debt (% of GDP)	2,296	44.1	22.0	1.5	155.4
One-year-ahead GDP growth expectations (%)	2,320	4.1	2.4	-9.2	10.8
Equity volatility (std)	2,131	1.3	0.8	0.3	6.1

Source: Authors' calculations.

3.2 A receiving-country approach

To delve deeper into how changes in physical and transitions risks may influence capital flows, we draw on the literature relating capital flows to EMEs to push and pull factors. In a comprehensive literature review on the determinants of capital flows, Koepke (2019) identifies four common areas as pull factors: i) the growth of the real sector, ii) risk premia and risk aversion, iii) the level and spread of policy rates, and iv) country risk. Based on these findings, we follow Aguilar et al (2025) to include a vector of domestic variables to control for key pull factors. We limit this set of variables to maintain a parsimonious model while incorporating our green pull factor variable of interest. We control for all types of push factors through a full set of time fixed effects. Finally, we employ local panel projections (Jordà, 2005) for 21 EMEs to assess the

¹⁵ We normalised environmental factors country by country to measure the effect of one standard deviation within each country's own experience.

statistical significance of the quarterly projections following the impact. We estimate the following equation:

$$Y_{i,t+h} = \delta^h Y_{i,t-1} + \beta^h env_{i,t} + \theta^h Domestic\ controls_{i,t-1}^h + \alpha_i + \sigma_t + \varepsilon_{i,t+h}^h \quad (1)$$

where $Y_{i,t+h}$ are gross capital inflows to country i (portfolio, bank or FDI) over the next $h = 0...8$ quarters; $Y_{i,t-1}$ is the lag of the dependent variable. $env_{i,t}$ is our variable of interest, namely extreme weather events, climate-related policies, and the share of green energy to produce electricity (as % of total energy use to produce electricity). The vector $Domestic\ controls_{i,t-1}$ includes one lag of the policy rate, government debt as percentage of GDP, short-term GDP growth expectations and domestic equity volatility. Time fixed effects (σ_t) control for global (push) factors and common events across countries (eg movements in international prices of oil and gas) and country fixed effects (α_i) for time-invariant country characteristics.¹⁶ We report Driscoll and Kraay standard errors, accounting for cross-sectional dependence.

3.3 Receiving-sending country approach for FDI and bank flows

The receiving country methodology allows us to examine how factors in the receiving country affect capital flows, but it does not enable us to assess the impact of sending country factors. We therefore complement it with a receiving-sending country model that uses annual bilateral data on FDI inflows and quarterly bilateral data on bank flows to further analyse how environmental characteristics in sending countries can influence capital flows to EMEs, particularly how environmental regulation in the sending country can affect investment in EMEs. To achieve this, we estimate the following regression:

$$Y_{i,j,t+h} = \delta^h Y_{i,j,t-1} + \beta^h env_{j,t} + \theta'_h X_{i,t-1} + \phi'_h X_{j,t-1} + \alpha_i + \gamma_j + \sigma_t + \alpha_i * \gamma_j + \varepsilon_{i,j,t+h} \quad (2)$$

where $Y_{i,j,t}$ are FDI inflows or bank inflows from sending country j to receiving country i in year t . $env_{j,t}$ defines the environmental factor of interest in sending country j in year t . $X_{i,t}$ and $X_{j,t}$ are controls for domestic factors in sending and receiving countries in year t , similar that those in the receiving-country approach. That is, we also include one lag of the policy rate, government debt as percentage of GDP, short-term GDP growth expectations and domestic equity volatility for AEs. α_i , γ_j and σ_t are sending-country, receiving-country and time-fixed effects. $\varepsilon_{i,j,t}$ is the error

¹⁶ When testing the use of green energy to produce electricity variable, we include as a control the share of nuclear energy to produce electricity as a control variable. The coefficients of these shares should be interpreted relative to the use of fossil sources (these three shares sum up to 100).

term. Finally, the term $\alpha_i * \gamma_j$ considers the paired sending and receiving fixed effects, accounting for the distance between countries (a variable broadly used in gravitational models for bilateral trade flows), as well as any fixed characteristic in the relationship between these two paired countries.

In summary, the first approach focuses exclusively on the receiving country, leveraging more granular data available at a quarterly frequency and disaggregated into FDI, portfolio investment and bank lending. The second approach adopts a broader perspective by incorporating factors from the sending countries. However, while quarterly data are used for bank inflows, annual data are used for FDI. These complementary approaches enable us to capture both the detailed nuances of capital flows at the receiving-country level and the broader bilateral dynamics between sending and receiving countries.

4. Results

This section presents the results for both approaches. We first discuss the results from the receiving country approach and then move to the sending-receiving country approach.

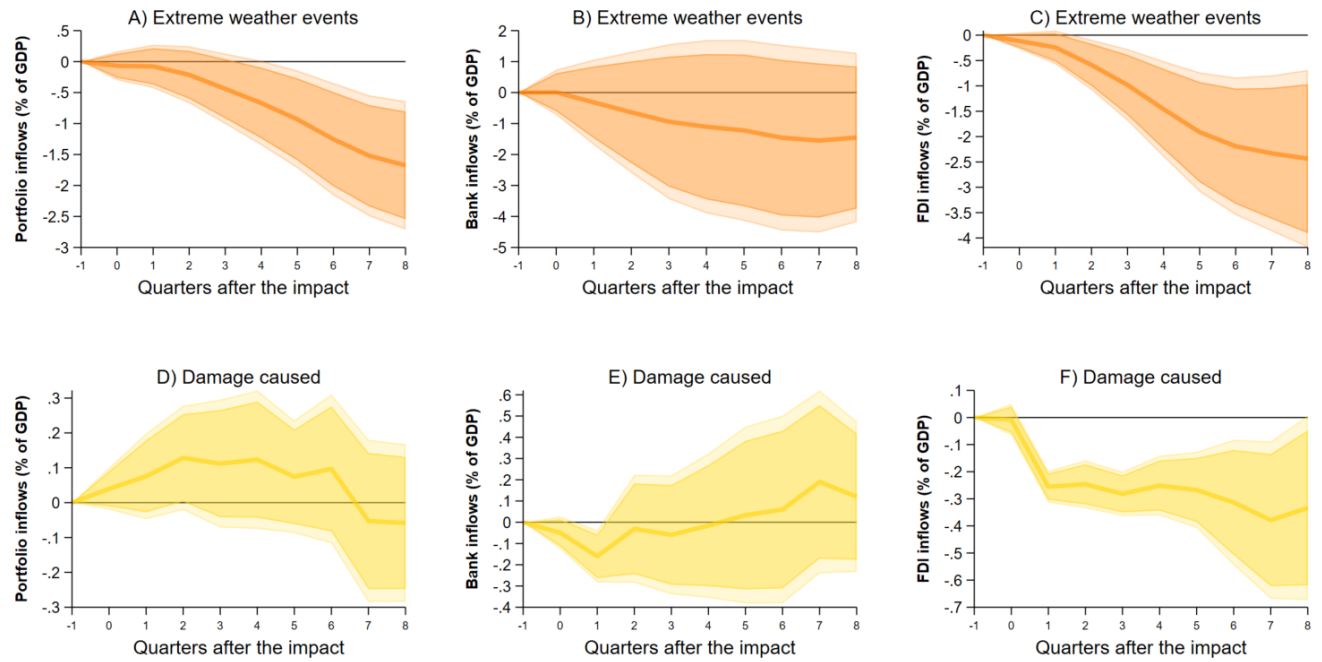
4.1 Receiving-country approach: receiving country factors

As discussed in the previous sections, we consider several environmental factors to test the hypotheses associated to each channel discussed in Section 2.

4.1.1 Physical risk channel

We find evidence supporting the discouragement of investment hypothesis. An increase in the number of extreme weather events is associated with lower portfolio and FDI inflows to EMEs (Graphs 3.A and 3.C) but has no statistically significant effect on bank flows (Graph 3.B). It appears that the effect is not immediate, as it takes some quarters for extreme weather events to discourage foreign capital. However, once the effect materialises, it is long-lasting. More severe extreme weather events are also associated with a small drop in bank inflows and a sharper one in FDI (Graphs 3.E and 3.F). While the effect dissipates quickly for bank flows, it is long-lasting for FDI.

Graph 3. Physical risk matters for the three types of capital inflows to EMEs.

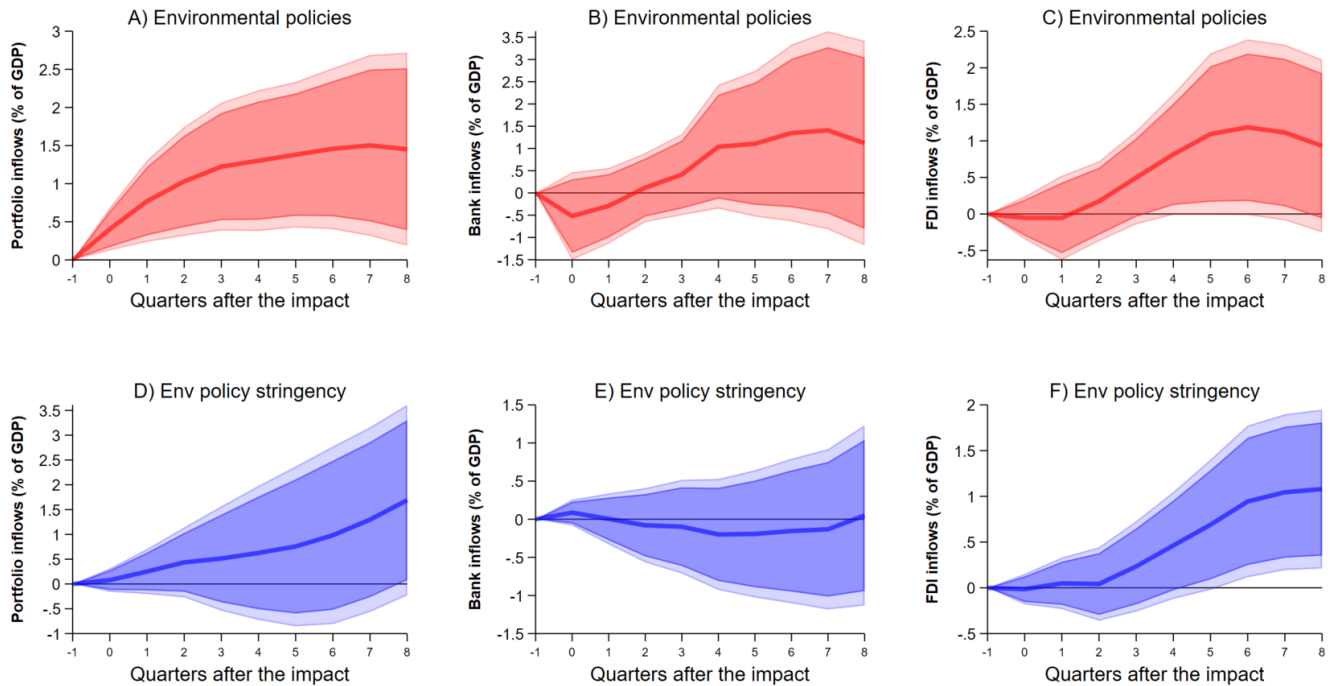


4.1.2 Environmental regulation channel

On average, receiving countries with more environmental regulations tend to attract higher foreign investment. An increase in the number of environmental policies is associated with higher portfolio investment and FDI inflows after the number of such policies increase following the 2016 Paris Agreement (Graphs 4.A and 4.C). We do not find any effect on bank lending (Graph 4.B). Specifically, we find that a one (country-specific) standard deviation increase in the number of green policies is associated with a 1.3 percentage point of GDP increase in capital inflows.¹⁷ In addition, a one (country-specific) standard deviation increase in the stringency of environmental policies is associated with higher FDI inflows (Graph 4.F), but not other types of inflows. This suggests that the more seriously EMEs take environmental regulation, the more likely they are to attract future FDI inflows, which we take as evidence for the “seal-of-approval” mechanism outlined above. Note that our results do not suggest that emission shifting (the other hypothesis mentioned in the previous section) does not play a role, only that for the average economy it is outweighed by the seal-of-approval mechanism.

¹⁷ To put these findings into context: Aguilar et al. (2025) finds that a one-standard deviation increase in equity volatility reduces capital flows to EMEs by some 4% of GDP. A one-standard deviation increase in growth expectations lifts capital flows by 1.5% of GDP. For inflows positively influenced by an increase in GDP growth expectations. This means that the estimated impact of environmental regulations is smaller than that of the common push and pull factors but not that much smaller.

Graph 4. Environmental regulation in the receiving country is associated with higher capital inflows to EMEs, except for bank inflows.



Note: In red: impact of one standard deviation increase of climate-related policies on capital inflows to EMEs. In blue: impact of one standard deviation increase of the stringency levels of environmental policies on capital inflows to EMEs. Panel local projections for 21 EMEs from 2016 to 2024. Light area: Confidence intervals at 95%; dark area: confidence intervals at 90%. Driscoll-Kraay standard errors, accounting for cross-country dependency.

4.1.3 Energy mix channel

The final environmental channel we examine is the greenness of the energy mix. Our findings indicate that the greenness of the energy mix has become a significant determinant of capital flows only after the implementation of the Paris Agreement. Specifically, as shown in Graph 5, the association before (upper panels) and after (lower panels) the Paris Agreement reveals a significant change in dynamics. From 1996 to 2015, an increase in the share of renewable energy used to produce electricity in EMEs is negatively associated with portfolio inflows, with no statistical evidence of an association with bank or FDI inflows (Graphs 5.A, 5.B and 5.C).

After the Paris Agreement, these patterns changed. We observe that an increase in the share of green energy is followed by higher portfolio and FDI inflows relative to the use of fossil fuel energies (Graphs 5.D and 5.F). A 1 percentage point (pp) increase in the share of renewable electricity production is followed by a cumulative rise in both portfolio and FDI inflows of up to 0.4 pp of GDP in the subsequent quarters.¹⁸ Finally, to ensure that 2016 was not an arbitrary cut-off year, we tested

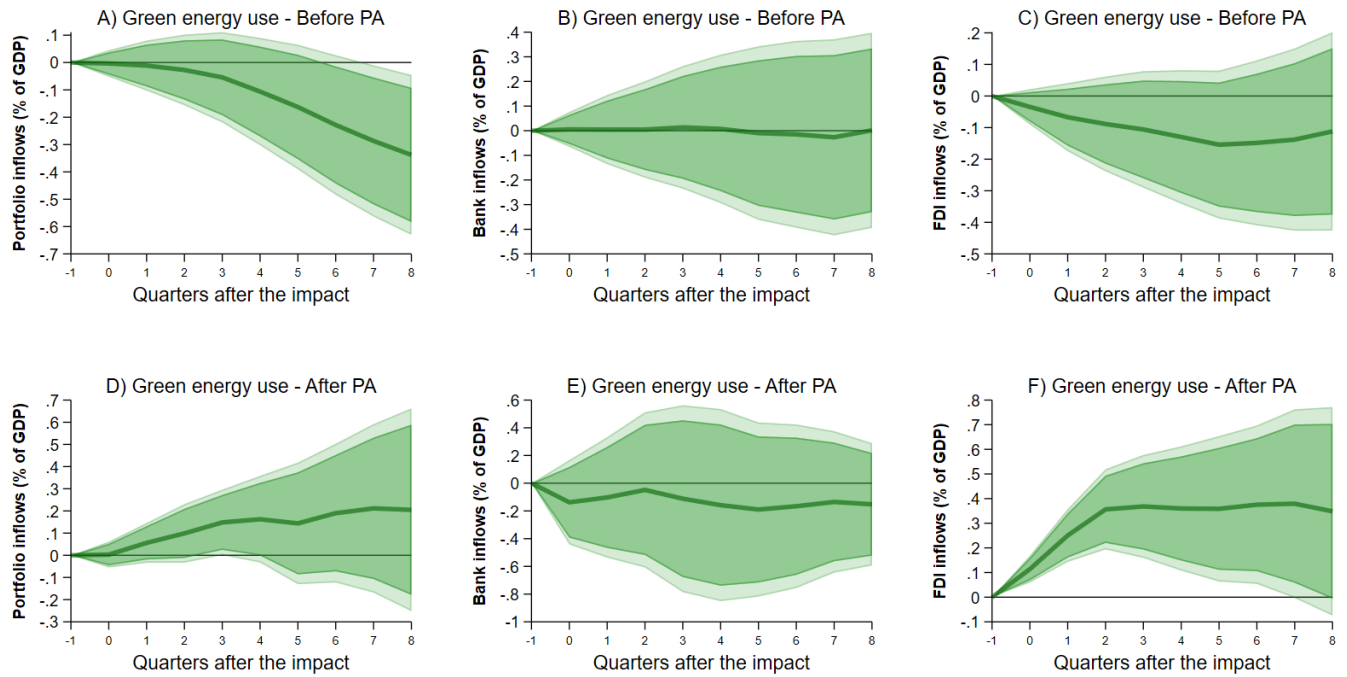
¹⁸ This is in line with mixed evidence on how banks are considering environmental issues in their lending. In the euro area, that some banks appear to factor them into their lending decisions, but others do not. See Aiello (2024), Degryse et al (2023), Erten and Ongena (2023) and Gambacorta et al (2023). Kacperczyk and Peydró (2022) find that while banks reduce lending to firms with high carbon emissions, they do not lend to high-emissions firms with ambitious carbon reduction targets, perhaps because of their limited credibility.

different cut-offs around it (ie, by splitting the sample before and after 2014, 2015, 2017 and 2018) and did not find any statistical evidence of positive inflows associated with a greener energy mix.

In parallel, the use of fossil fuels became negatively associated with capital inflows to EMEs relative to the use of green energy. For completeness, Graph 6 shows that a 1 pp increase in the share of fossil fuel energies is negatively associated with lower portfolio and FDI inflows to EMEs after the Paris Agreement (Graphs 6.D and 6.F), with 95% confidence.

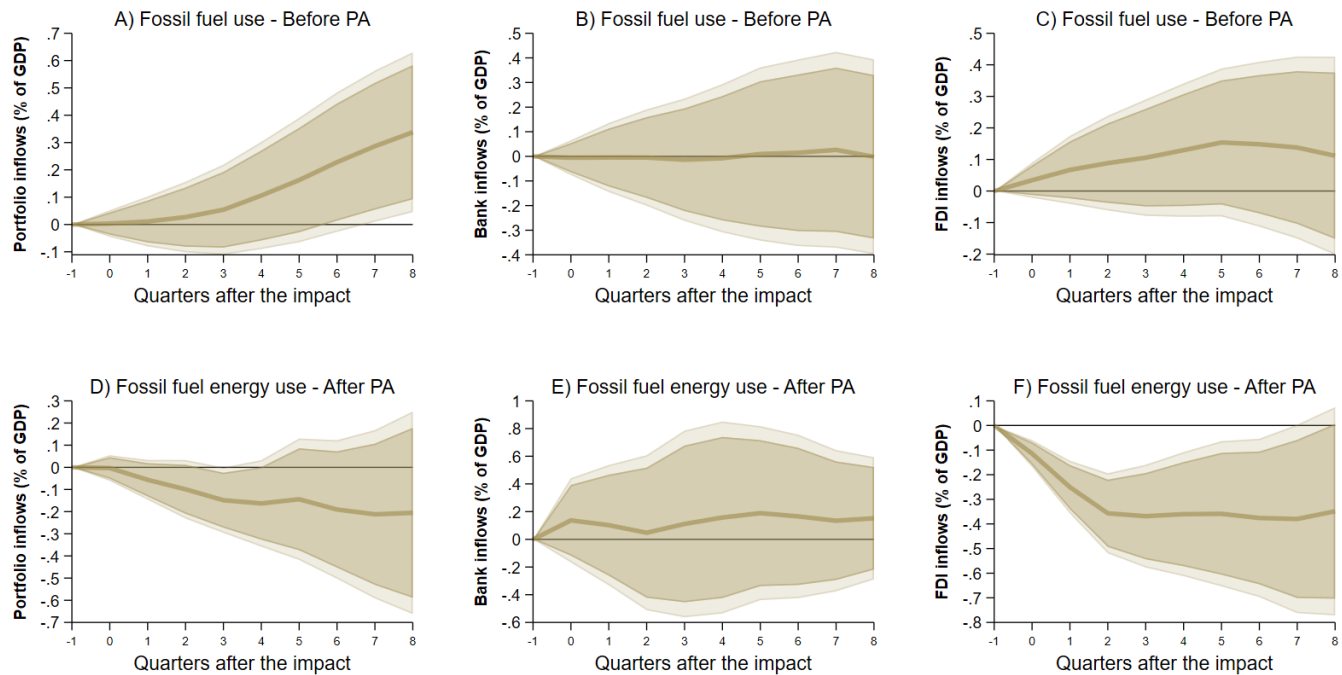
This new channel explored in this paper opens the door to further examining the role of energy mix in attracting capital flows to EMEs.

Graph 5. A rising share of renewable energy is associated with higher portfolio and FDI inflows after the Paris Agreement (PA).



Note: In green: Impact of 1% increase of renewable energy use on capital inflows to EMEs. Panel local projections for 21 EMEs. Before PA: 1996-2015; after Paris Agreement: 2016-2024. Light area: Confidence intervals at 95%; dark area: confidence intervals at 90%. Driscoll-Kraay standard errors, accounting for cross-country dependency.

Graph 6. The use of fossil fuel energy is associated with lower portfolio and FDI inflows to EMEs after the Paris Agreement (PA).



Note: In green: In brown: Impact of 1% increase of fossil energy use on capital inflows to EMEs. Panel local projections for 21 EMEs. Before PA: 1996-2015; after Paris Agreement: 2016-2024. Confidence intervals at 95%; dark area: confidence intervals at 90%. Driscoll-Kraay standard errors, accounting for cross-country dependency.

4.2 Bilateral approach – the role of sending country characteristics

The results above suggest that environmental factors play a crucial role in influencing capital flows to EMEs. To complement these findings, we now turn to the second approach, which incorporates environmental factors from the sending countries. We test two potential additional effects. First, within the transition risk channel, we test for “emission shifting”, where AEs relocate investment to environmentally looser EMEs, and for “seal of approval” effects, where AEs invest in environmentally stricter EMEs. Second, we study the relationship between the energy mix of the recipient country with regulations in the sending country.

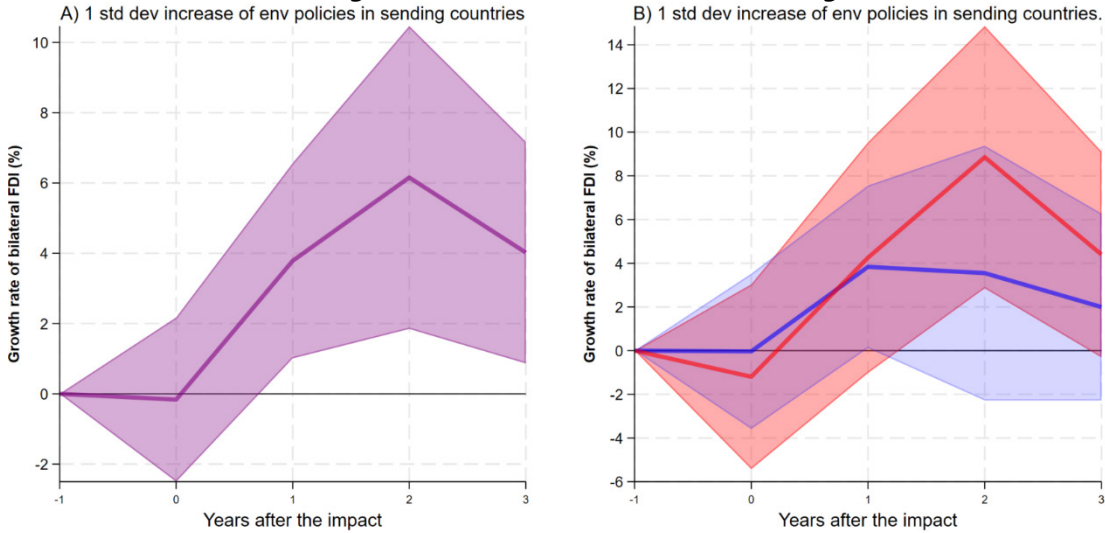
4.2.1 Environmental regulation in sending country vs environmental regulation in receiving country

First, we estimate the impact of a one standard deviation increase in environmental regulation in the sending countries on both FDI and bilateral bank inflows. Graph 7.A shows that more environmental policies in the sending countries are associated with higher FDI. A one standard deviation increase in number of environmental policies in the sending country is followed by a 6% increase in the growth rate of bilateral FDI inflows to EMEs after two years. This suggests that environmental factors in sending countries matter for capital flows to EMEs, making this paper the first to present such a result.

The results are stronger for EMEs with lower environmental regulations. Graph 7.B shows that a one standard deviation increase in policy regulation in AEs is associated with a 9% increase in capital inflows to EMEs with lower environmental regulations after two years (red lines), compared with a 4% increase for EMEs with stronger regulations (blue lines). These findings show that “emission shifting” does play a role in explaining capital flows to EMEs, in addition to the “seal-of-approval” mechanism that we found in the receiving country regressions above.

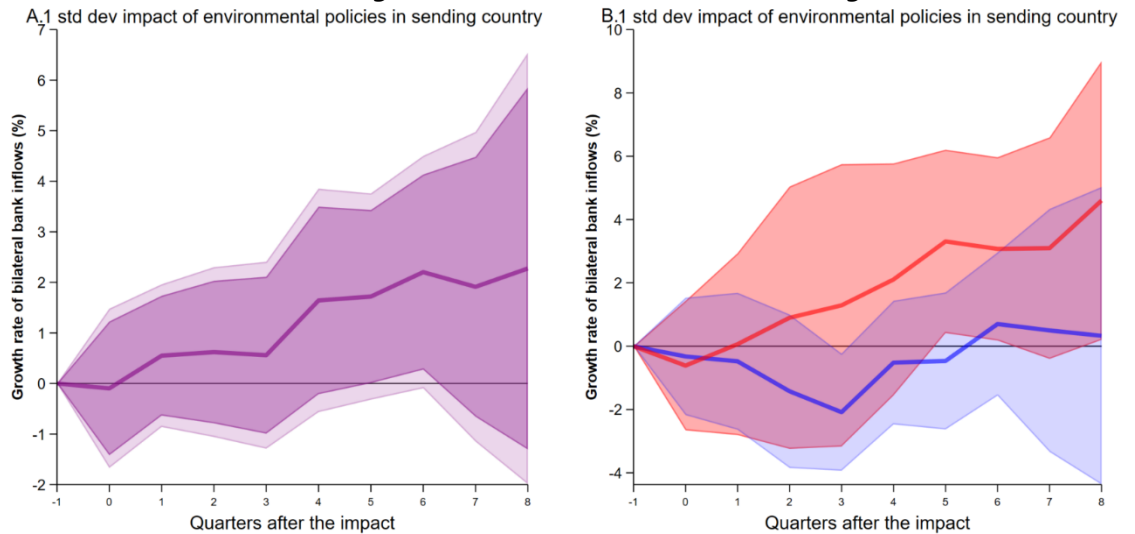
We find a similarly strong association for bank flows. A one standard deviation increases in environmental regulation in sending countries is followed by a 2% increase in bilateral bank inflows to EMEs (Graph 8.A). Again, this effect is larger and, in this case, primarily driven by the group of EMEs with low policy regulation (Graph 8.B, red lines), confirming the “emission shifting” effect.

Graph 7. Impact of environmental policies in the sending country on bilateral FDI inflows to EMEs with high and low levels of environmental regulation.



Note: In Panel A (purple): the impact of a one standard deviation increase in climate-related policies in sending countries on FDI inflows to EMEs from 2010 to 2023. In Panel B (red): the same impact, but in EMEs with low environmental regulation. In Panel B (blue): the same impact, but in EMEs with high environmental regulation. Regressions control for receiving, sending, paired and time fixed effects and include a vector of domestic controls for both EMEs and AEs. Confidence intervals are at 95%. Driscoll-Kraay standard errors, accounting for cross-country dependency.

Graph 8. Impact of environmental policies in the sending country on bilateral bank inflows to EMEs with high and low levels of environmental regulation.



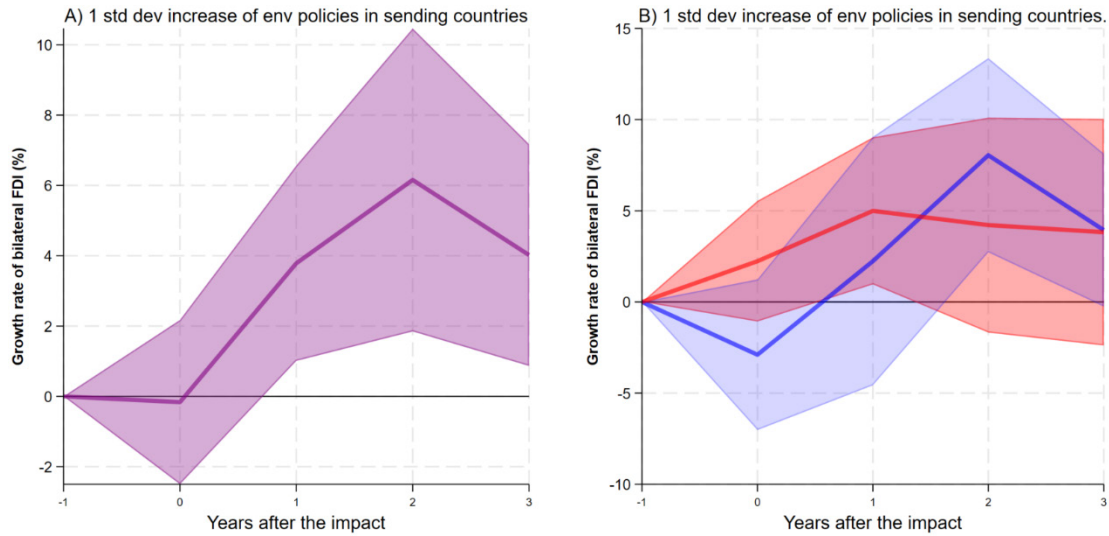
Note: In Panel A (purple): the impact of a one standard deviation increase in climate-related policies in sending countries on bank inflows to EMEs from 2016 to 2024. In Panel B (red): the same impact, but in EMEs with low environmental regulation. In Panel B (blue): the same impact, but in EMEs with high environmental regulation. Regressions control for receiving, sending, paired and time fixed effects and include a vector of domestic controls for both EMEs and AEs. Confidence intervals are at 95%. Driscoll-Kraay standard errors, accounting for cross-country dependency.

4.2.2 Environmental regulation in sending country vs energy mix in receiving country

In this final exercise, we examine the potential link between the energy mix of EMEs and the stringency of environmental policies in the sending country. As noted in the hypothesis section, stricter regulations in the sending country could channel more capital to EMEs with a higher green energy mix, as investors and lenders aim to align their portfolios with environmental standards and emission goals. While Graphs 9.A and 10.A similar linear effects to those already discussed above, we also find consistent evidence in Graphs 9.B and 10.B that stricter environmental policies in the sending countries are associated with a higher growth rate of FDI and bilateral bank inflows to EMEs with a high share of renewable energy mix. A one standard deviation increase in stricter environmental regulation is linked to 8% and 6% growth rates for FDI and bilateral bank inflows to EMEs, respectively (Graphs 9.B and 10.B, blue lines), with stronger effects than in the regime with low use of renewable sources (Graphs 9.B and 10.B, red lines). Finally, we find that these effects are larger and more pronounced in the longer term, which suggests that the benefits of a greener energy mix take time to appear but can be more beneficial for capital flows to EMEs.

This exercise provides new evidence supporting our hypothesis that the energy mix channel exists, and that it is stronger in EMEs with a high share of renewable energy sources.

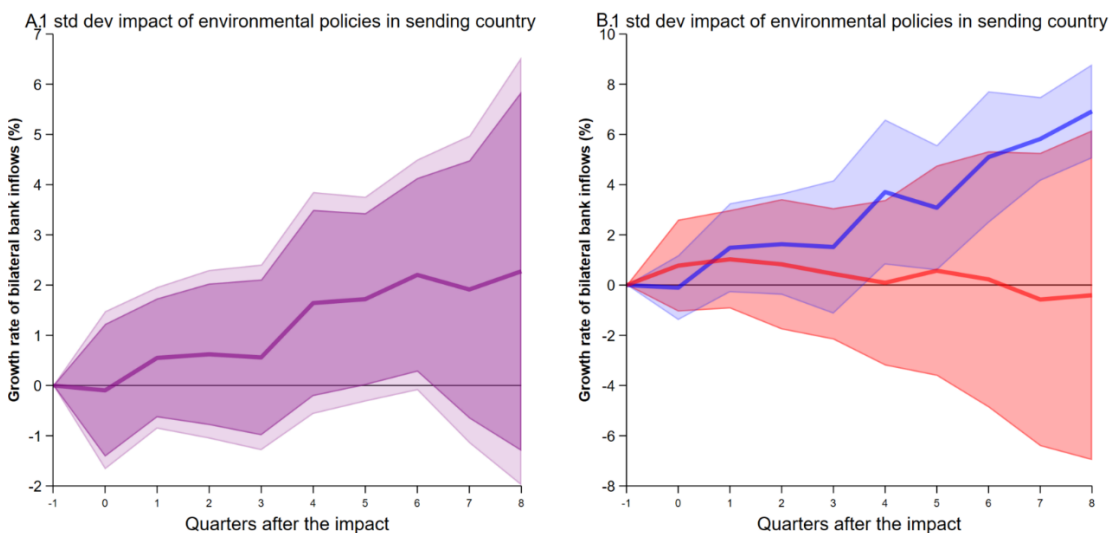
Graph 9. Impact of environmental policies in the sending country on bilateral



FDI inflows to EMEs with high and low levels of green energy mix.

Note: In Panel A (purple): the impact of a one standard deviation increase in climate-related policies in sending countries on FDI inflows to EMEs from 2010 to 2023. In Panel B (red): the same impact, but in EMEs with low share of green energy use. In Panel B (blue): the same impact, but in EMEs with high share of green energy use. Regressions control for receiving, sending, paired and time fixed effects and include a vector of domestic controls for both EMEs and AEs. Confidence intervals are at 95%. Driscoll-Kraay standard errors, accounting for cross-country dependency.

Graph 10. Impact of environmental policies in the sending country on bilateral bank inflows to EMEs with high and low levels of green energy mix.



Note: In Panel A (purple): the impact of a one standard deviation increase in climate-related policies in sending countries on bank inflows to EMEs from 2016 to 2024. In Panel B (red): the same impact, but in EMEs with low share of green energy use. In Panel B (blue): the same impact, but in EMEs with high share of green energy use. Regressions control for receiving, sending, paired and time fixed effects and include a vector of domestic controls for both EMEs and AEs. Confidence intervals are at 95%. Driscoll-Kraay standard errors, accounting for cross-country dependency.

5. Concluding remarks

Environmental considerations are increasingly shaping the allocation of capital across countries, with significant implications for EMEs. This paper provides empirical evidence that environmental factors – including physical and transition risks, as well as the greenness of the energy mix, a pull factor not studied before in the international finance literature – might play a role in attracting capital flows to EMEs. By employing two complementary approaches in a panel analysis, we show the prevalence of strong statistical associations in both receiving and sending country environmental characteristics influencing capital inflows to EMEs.

Our findings highlight that EMEs with a greener energy mix, less exposure to extreme weather events and stronger climate-related policies tend to attract more foreign capital, particularly in the form of FDI and portfolio investment. However, the effects vary by type of flow, with cross-border bank lending showing limited sensitivity to these factors. Temporal differences also emerge, as the positive impact of a green energy mix on capital flows becomes evident only after the Paris Agreement came into effect in 2016.

From the perspective of sending countries, stricter environmental regulations are associated with increased FDI and bilateral bank inflows to EMEs. This relationship is particularly strong for EMEs with weaker environmental regulations, supporting the “emission shifting” effect. At the same time, EMEs with a higher green energy mix attract greater investment from AEs with stringent environmental policies, further underscoring the importance of environmental alignment in shaping capital flows.

This paper contributes to the new literature on the intersection of environmental factors and international capital flows. By expanding the scope of analysis to include portfolio investment, exploring the interplay between sending and receiving country characteristics, and incorporating for the first time the use of renewable energy sources in the analysis of capital inflows to EMEs, we provide a more comprehensive understanding of how environmental factors influence capital allocation to EMEs.

Our findings have important policy implications. Adopting stringent environmental policies, as well as increasing the share of renewable energy, can help EMEs attract foreign capital. Moving to a greener energy mix also helps boost foreign inflows.

Future research could build on this work by exploring the long-term effects of environmental factors on capital flows and examining the role of other environmental variables, such as biodiversity and water scarcity. Additionally, further analysis could adopt more micro-fundamental approaches to better infer causality in these empirical relationships.

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