

INFLUENCE OF INSTITUTIONS AND INTERNATIONALIZATION ON ENVIRONMENTAL PERFORMANCE OF METALLURGICAL MNEs

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Goal: the paper aims to uncover how institutions and internationalization influence the environmental performance of metallurgical multinational enterprises (MNEs). More specifically we pose the following research questions: what is the effect of internationalization and institutions in both home and host market on MNEs environmental performance; whether MNEs mitigate institutional pressure in their home countries by expanding their internationalization?

Methodology: the paper builds on quantitative analysis based on panel data regression. We analyze a dataset of the largest metallurgical MNEs from different countries, covering the period from 2017 to 2020. We focus on metals and mining sector which is a major contributor to the global greenhouse gas emissions. **Findings:** we find that internationalization and stringent climate policies in home country are positively associated with environmental performance of metallurgical MNEs. Additionally, we observe that general institutional factors in the home country, such as the protection of minority shareholders also contribute to the environmental advancement of MNEs. Though, the extensive internationalization of metallurgical firms negatively moderates the relationship between stringent climate regulations in the home country and their environmental performance. **Originality and contribution of the authors:** our findings indicate that despite the overall trend of improving environmental performance, metallurgical MNEs with a higher proportion of foreign sales exhibit worse environmental performance hinting that they may adopt “carbon haven” logic when faced with stringent climate regulations in their home country.

Keywords: MNEs, environmental performance, internationalization, “carbon haven”, metal industry, ESG.

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INTRODUCTION

There is a general consensus around the necessity for firms and industries to move from reliance on carbon intensive fossil fuel to more climate-friendly sources of energy [Nippa, Patnaik, Taussig, 2021]. Addressing the grand challenge of climate change is a vital priority for governments across the world, while the complexity and scope of the issue requires involvement of a variety of players at different levels, both national and international [George et al., 2016]. The role of business actors in achieving this goal is considered essential, as proved by a rising call for research expressed by leading institutions and journals to reconsider sustainability agenda through the business strategy lens [Buckley, Doh, Benischke, 2017].

In the face of substantial climate change, environmental engagement becomes vital for companies [Kim et al., 2022]. To encourage firms' sustainable transition towards more climate-friendly solutions, governments around the world introduced various regulative measures that provide firms with economic incentives to reduce their carbon emissions by means of pricing CO₂ emissions [Nippa, Patnaik, Taussig, 2021]. These regulations are a part of the institutional setting that affects firms' climate strategies.

Though, despite the progress in setting up national climate policies, the global regulatory framework remains fragmented given substantial gaps across various countries in terms of the level of climate policy ambition and the stringency of the policy instruments in force. The latter leads to a variety of firm-level strategies which may result either in a race to the top where environmental responsibility becomes a source of competitive advantage, or in a race to the bottom, where firms may prefer to benefit from locations with looser environmental policies [Bu, Wagner, 2016]. So, the emerging strand of literature on climate challenges aims to explore the conditions of interrelation between the international

and national-level policies and business strategies in order to navigate the tectonic shifts associated with the transition towards a cleaner economic system.

Considering firms environmental strategies, institutional theory embraces a variety of actors and multi-level regulation that affect global climate action. Institutional theory is able to shed light on the institutional complexities that drive climate strategies of multinational enterprises (MNEs) [Bass, Grøgaard, 2021]. The institutional setting with regards to climate includes drivers that relate directly to environmental strategies of companies, such as various regulations, and general institutional drivers such as minority shareholders protection. Though, the research to date paid limited attention to MNEs' climate strategy drivers [Bass, Grøgaard, 2021] given that the global and formalized recognition of the urgency of the climate problem is a relatively new phenomenon.

Scholars highlight the need to consider both firm- and industry-level characteristics when investigating firms' environmental strategies in light of various regulations [Young, Makhija, 2014]. Yet, there is little evidence in the academic literature concerning the way how companies from particular industries position themselves towards sustainability pressures. It also remains an open question how firms in certain industries address the rising environmental concerns and how it shapes their strategic response with regards to location, entry-mode, and other strategic choices. When firms internationalize they face a variety of climate regulations and mechanisms at host markets that they need to comply with [Özen, Krüskü, 2009; Wood et al., 2021]. Therefore, we aim to untangle the relationship between the institutional factors of MNEs environmental action and internationalization, which imposes constraints and creates opportunities for MNEs' strategies in the context of climate change.

In our study, we focus on metals and mining sector which stands as a major con-

tributor to greenhouse emissions worldwide [Martus, 2019]. Climate change and sustainability issues pose substantial challenges to MNEs in this sector in terms of infrastructure risks, cost of energy supplies, transport routes [Martus, 2019]. Metals industry is traditionally seen as a basic industry vital for the development of an industrialized way of life [OECD, 2017]. Decarbonization choices relative to this sector are intertwined with national economic and social policy choices given the weighty contribution of the traditional industrial sector to the domestic economic development and employment [World Steel Association, 2019]. The latter justifies the relevance of sustainability challenges for metallurgical MNEs and thus makes our research a timely contribution.

In this paper we aim to uncover how institutions and internationalization influence the environmental performance of metallurgical MNEs. More specifically we pose the following research questions: what is the effect of internationalization and institutions in both home and host market on MNEs environmental performance; whether MNEs mitigate institutional pressure in their home countries by expanding their internationalization?

Our contribution is twofold. First, we extend the understanding of institutional drivers on MNEs' environmental performance, both directly climate-related (such as carbon pricing), and general overwhelming institutions (such as minority shareholders protection). Second, we reinvigorate the "carbon haven" argument which posits that global regulatory failure in the area of climate change allows for carbon leakage through MNEs relocation strategies towards countries with laxist environmental policies. So, we challenge the conventional wisdom which asserts a positive influence of strong institutions and internationalization on MNEs environmental performance, by highlighting the versatile impact of MNEs location choices in context of the climate agenda. Our empirical dataset validates the carbon haven hypothesis.

In order to address these inquiries, we conducted an analysis using a dataset comprising 230 metallurgical firms from various regions worldwide, covering the period from 2017 to 2020. Our rigorous statistical examination reveals a compelling link between internationalization, institutional regulation in the home country, and the environmental performance of metallurgical firms. Notably, our findings indicate that MNEs operating within the industry employ strategies aimed at circumventing stringent regulations through their global expansion efforts.

The rest of the paper is organized in the following way: in the first section the literature review was conducted and hypotheses are formulated, in the second section the methodology and empirical testing results are described, and finally in the third section discussion of findings and conclusions are presented.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Environmental performance and internationalization

MNEs are considered important actors when it comes to environmental issues. It is widely accepted in the literature that internationalization is a process of gradual engagement in international markets [Johanson, Vahlne, 1978]. Firms engage in international markets in different forms including export, foreign direct investment or partnerships. MNEs have a great potential for innovation that can lead to the development of sustainable products [Hall, Vredenburg, 2003], yet there are contradictory opinions concerning the willingness of MNEs to develop those.

The relationship between firms' internationalization and their environmental sustainability has received a growing amount of attention in recent years [Kolk, Pinkse,

2008; Wood et al., 2021], yet with no consensus on how firms' internationalization affects their environmental performance [Ahmadova et al., 2022]. There are two strands of literature that explain how internationalization is related to environmental activities of firms. First camp considers firms as active players to tackle the environmental issues [Khanna, Palepu, 2004; Nippa, Patnaik, Taussig, 2021], since they strive to produce advanced green solutions and products that ultimately provide them with firm-specific advantages that can further be used globally [Rugman, Verbeke, 2001].

The second strand of literature calls this perspective into question and highlights the complexity of managing geographically dispersed operations that results in poorer environmental performance [Aragón-Correa, Marcus, Hurtado-Torres, 2016]. Firms are also considered to engage in corporate political activities (CPA) to influence regulations in their favor [Nippa, Patnaik, Taussig, 2021]. Within this stream of literature some scholars connect international activities of MNEs with their wish to choose host markets where regulative pressures are loose, so called "pollution havens" [Nippa, Patnaik, Taussig, 2021; Candau, Dienesch, 2017; Li, Zhou, 2017]. In this lens, internationalization is tied to the reasoning of choosing location with loose environmental regulations. Therefore, this stream of literature concludes that increasing internationalization does not automatically mean that environmental standards of MNEs progress. Overall, recent studies provide inconclusive results concerning the relationship between internationalization and environmental performance [Wood et al., 2021]. Hence, we contend that industry specificity can play a crucial role in understanding the relationship between internationalization and environmental performance.

Metal industry is traditionally dominated by MNEs which own major production facilities, with a large amount of prod-

ucts being traded internationally. At the same time, regional dimension plays a crucial role in international strategies as a result of high shipping costs and preferential market access conditions granted under regional trade agreements [OECD, 2017]. We assume that the metal industry, being highly integrated in global value chains, is extremely dependent on diverse stakeholders both domestically and internationally, and thus will have to comply with their expectations of "decent environmental behavior".

MNEs are exposed to various pressures from the host-markets where they operate, and these pressures make them develop their environmental responsibility [Gómez-Bolaños et al., 2022; Kassinis, Vafeas, 2006]. As the level of internationalization increases, so does the range of stakeholders involved, thus metallurgical MNEs may be more inclined to demonstrate higher environmental sustainability [Gómez-Bolaños et al., 2022]. It means that MNEs have to respond to the pressures of culturally, politically, and economically more diverse stakeholders which is one of the ways of increasing their sustainability activities [Gómez-Bolaños et al., 2022; Brammer et al., 2009]. Scholars argue that firms that expand overseas reduce the risk associated with internationalization by strengthening their sustainability activities, where the environmental dimension is an essential one [Attig et al., 2014]. Internationalization in a form of export is associated with a lower likelihood of decoupling between the corporate disclosure of positive environmental activities and the factual underperformance in MNEs [Tashman, Marano, Kostova, 2019].

Therefore, we presume a positive relationship between metal firms' internationalization and their environmental performance.

Hypothesis H1. The extent of internationalization of metallurgical MNEs is positively associated with their environmental performance.

Environmental performance and institutions

Institutional theory states that firms respond to external pressures to achieve conformity with social rules of the game. Legitimacy theory emphasizes that firms obtain their “license to operate” from their stakeholders in return to their socially responsible or legitimate actions [Huang, Huang, 2009; Khan, Muttakin, Siddiqui, 2013; Udayasankar, 2008]. Therefore, we assume that a firm’s engagement in environmental practices is a response to external pressure. On top of that this response can be either proactive when initiating sustainability actions or reactive when avoiding negative outcomes.

In order to encourage firms’ sustainable transition towards more climate-friendly solutions, governments around the world introduced various regulative measures that provide economic incentives to reduce their carbon emissions by means of pricing CO₂ emissions [Nippa, Patnaik, Taussig, 2021]. Regulatory efforts of governments are essential when it comes to successful energy transition [McKinsey, 2023a]. As the authors of the paper [Pinkse, Kolk, 2012] put it, green transition is a complex institutional process with quite a strong government involvement.

Despite the global trend towards strengthening climate policies in the framework of the international Paris Agreement, climate and environmental regulations remain nationally determined. The global regulatory space is fragmented. As of 2023, there were 73 different carbon pricing initiatives (carbon taxes or emission trading systems) in the world, which altogether make up to about 23% of global carbon emissions covered. Within these national initiatives, the carbon prices range from less than one dollar per ton of CO₂ equivalent in Ukraine and Poland up to 156 dollar per ton of CO₂ in Uruguay [World Bank, 2023].

Institutional factors affect the way how MNEs perceive environmental agenda and

how they act upon it. When firms expand to other countries, they face the need to comply not only with domestic but also with host-market institutional settings to come across as legitimate actors [Panibratov, Veselova, Ermolaeva, 2015]. Environmental regulations and generally expectations of host-market stakeholders towards environmental sustainability of firms belong to the institutional setting. In this sense, internationalization is perceived as a driver of environmental performance of MNEs, given that environmental action is a substantial part of MNEs legitimation strategies in host countries. Thus, companies face a set of regulative and normative pressures in their operations on home and host markets, and the congruence of the two affects the way MNEs act towards sustainability issues [Özen, Krüskü, 2009]. Because of these pressures, firms exhibit different responses towards sustainability. Regulative pressures are coercive and include the requirement that firms face by the legislative bodies of countries where they operate [Özen, Krüskü, 2009].

Institutional theory claims that organizations are embedded within institutional environments that affect their strategies. Studies that use institutional perspective to assess the influence of various regulations on firms’ environmental activities reveal that institutional factors influence corporate sustainable development [Bansal, 2005], yet when it comes to environmental regulations specifically, the results are still inconclusive [Aguilera-Caracuel et al., 2013].

Metals industry is considered a crucial enabler of the net-zero transition because decarbonization with its focus on developing new technologies often requires more physical materials than used conventionally [McKinsey, 2023b]. Such an important role of metals in the climate transition requires this industry, on one hand, to accelerate the speed of production, and on the other hand, to tackle the problem of the unsustainable production of metals. We expect that countries with stronger envi-

ronmental regulations will be induced to advance the environmental strategies [Ahmadova et al., 2022], which will therefore translate into higher environmental performance.

Hypothesis H2. Stringency of home country's climate policies is positively correlated with environmental performance of metallurgical MNEs.

Carbon pricing is a market-oriented tool that is used in many countries to stimulate firms to cut greenhouse emissions and combat climate change [Zhu et al., 2022]. Carbon pricing that includes emission trading schemes and carbon taxes is considered a vital instrument in policy towards net zero greenhouse gas (GHG) emissions [Errendal, Ellis, Jeudy-Hugo, 2023]. A key characteristic of carbon pricing is that it is used to align the costs of consuming the carbon-intensive fuels or engaging in carbon-intensive processes with the social costs of doing it [Pryor et al., 2023]. Despite the benefits for nature and society, carbon pricing can result in additional costs for companies [Babiker, 2005]. A cross-country variety of regulatory constraints and carbon prices allows MNEs to adjust their internationalization strategies, so as to locate the most polluting industrial facilities in the so called “carbon havens”, or “pollution havens”. The re-location of carbon-intensive production to countries with weak climate and environmental policies is usually referred to as “carbon leakage” [Branger, Quirion, 2014], which negatively affects the efficacy of home country environmental policy. Firms may follow the “pollution haven” logic when they formulate and execute their internationalization strategies.

The logic of carbon leakage as a response to carbon pricing is explained by the idea that MNEs are especially well-positioned to take advantage by selecting the most cost-efficient locations [Nippa, Patnaik, Taussig, 2021]. Therefore, internationalization can be related to searching for locations with looser environmental standards [Candau,

Dienesch, 2017]. Despite the relevance of this argument, there are some important contingencies that need to be taken into account in terms of response of firms towards carbon pricing, and one of them is industrial specifics. The influence of industrial specifics of firms towards carbon pricing remains scarcely studied. Authors of paper [Nippa, Patnaik, Taussig, 2021] argue that there is a need to investigate how industry characteristics affect the strategic response of firms. As highlighted by scholars [Cox et al., 2022], historically the mining industry showed opposition to carbon taxation in an attempt to reduce the financial burden to the industry, despite the results of research showing that metals and mining industry are to be among the beneficiaries of the carbon emission taxation in result of accelerated demand for energy transition metals [Cox et al., 2022].

Moreover, the metal and mining industry is the one that is location-bound and for firms in such industries it is on average more difficult to develop transferable firm-specific advantages to escape tight home-country regulations as a result of internationalization. Location-bound industries are generally determined by high plant and logistics costs, availability of natural resources and economies of scale [Nippa, Patnaik, Taussig, 2021]. Thus, firms from such industries depend more on home country regulations than firms from non-location bound industries [Panibratov, 2012]. We assume that metallurgical firms engaged in global trading experience double pressure from the home country and foreign markets, therefore internationalization would enhance the influence of stringent home country regulations on companies.

Hypothesis H3. Internationalization positively moderates the association between carbon pricing in the home country and environmental performance.

Environmental performance and corporate governance

Several studies have delved into the relationship between corporate governance and a firm's sustainability, particularly its environmental performance [Sancha et al., 2023; Mungai, Ndiritu, Rajwani, 2020]. Notably, recent scholarly attention has focused on the role of minority shareholders. Despite lacking direct control over company decision-making, these shareholders possess the ability to indirectly shape certain decisions, including environmental practices, through dialogues with managers [Stout, 2012] and other stakeholders. In some instances, they can present shareholder resolutions and vote on suggestions [Sparkes, Cowton, 2004; Sullivan, Mackenzie, 2008].

Previous research [Maffet et al., 2022; Nakhmurina, Skinner, 2022] demonstrates that the heightened threat of activism facilitated by shareholder-friendly governance practices results in policy changes within firms. The authors underscore that a governance framework favoring the involvement of minority shareholders in corporate decision-making is a crucial prerequisite for the emergence and success of activism. Furthermore, their extensive analysis of thousands of shareholder activist campaigns across over 50 countries revealed that the protection of minority shareholders facilitates their engagement in activism, exerting pressure on local companies. Some scholars interpret the pressure from public activism as a form of normative institution [Hyatt, Berente, 2017]. Normative pressures primarily encompass values and norms similar to social morality or normative expectations, originating from the general public and other professional organizations. Corporate behavior is shaped by these normative pressures, reflecting public values and expectations, often expressed through environmental activism or the initiation of citizen lawsuits [Zeng et al., 2023].

As reported by [Accenture, 2022], about 60% of investors are willing miners to en-

gage in aggressive decarbonization strategies, and affirm the intention to divest or avoid investing in mining firms showing poor decarbonization performance. Investor awareness of climate-related transition risks [Reboredo, Otero, 2021] and portfolio decarbonization strategies [Boermans, Galema, 2019] are now among key trends of financial market development. As evidenced by green shareholder activists' attacks against Big Oil, investor pressures are now substantially shaping MNEs' strategic decisions. Scholars found that China's capital market reforms aiming to enhance minority shareholders' rights positively affected corporate ESG performance [Song et al., 2023]. Thus, we expect that the minority investors' protection becomes a significant channel to enforce environmentally responsible behavior on behalf of industrial MNEs.

Hypothesis H4. Strong minority shareholders protection in the home country is positively associated with environmental performance of MNE.

METHODOLOGY

Empirical setting

We focus on the metals industry for the following reasons. From a techno-economic perspective, achieving net-zero targets requires decarbonizing the so-called hard-to-abate industries. Industrial emissions account for more than 30% of the global anthropogenic emissions, with the steel industry contributing for about 6% of the global emissions [WEF, 2022]. Metals industry is among the most challenging to decarbonize, in result of both technical factors like the need for high-temperature heating and related use of fossil fuels for industrial processes, and the economic factors such as capital intensity, long asset life, and low marginality [Gross, 2021; WEF, 2022]. The growth of the global economy and the population growth are expected to fuel the demand for industrial raw materi-

als in a long run perspective. Moreover, low-carbon trends unlock additional demand potential for such products as steel and aluminum given that they are used for the manufacturing of solar panels, wind turbines, electric vehicles or power grids [WEF, 2022].

From an organizational perspective, the industry is exposed to international operations as the location choices are mainly driven by the resource endowment and proximity to the demand centers. Though, the value chains in the industry are undergoing a fragmentation process, which implies a greater eye on ensuring quality and innovation at each consecutive stage of product transformation [OECD, 2017].

Finally, from a regulatory perspective, implementation of carbon pricing across various sub-national, national and regional zones stands now at the top of the policy agenda for climatic issues [World Bank, 2023]. Metallurgical industry is expected to be affected by carbon border adjustment taxes, such as the EU's Carbon Border Adjustment Mechanism (CBAM) or regional regulatory mechanisms aiming to address carbon intensity through carbon clubs [Rossetto, 2023]. Carbon prices are likely to significantly affect profitability in metals industries, with even minimum carbon price levels leading to make mining unprofitable [Tost et al., 2020].

Decarbonization of the metal industry is propelled by governmental efforts, but private players are increasingly involved as evidenced through decarbonization plans and roadmaps announced by several MNEs and industry associations [IEA, 2020]. However, the greenhouse gas emissions continue to rise, and greater ambition is expected from a diversity of stakeholders to approach the decarbonization targets [IEA, 2020]. Thus, exploring the drivers of metallurgical MNEs' decarbonization strategies is a timely and relevant research endeavor.

Our sample consists of 230 largest publicly-traded metallurgical firms. The data was obtained from the Thomson Reuters

database¹, which performs information on finance, ownership structure, international operations, ESG ranking and other. Ten largest MNEs are introduced in Table 1, among them are BHP Group (Australia), Vale SA (Brazil), Rio Tinto (UK), Nippon Steel Corp (Japan). Other MNEs are from China, Germany and the USA. Environmental performance of largest metallurgical MNEs varies from 60 (Baoshan Iron & Steel Co Ltd, China) to 86,5 (BHP Group Ltd). The extent of internationalization, measured as share of foreign sales, of top 10 MNEs are rather high — 63% in average, although for some firms it is very little like for Baoshan Iron & Steel Co, for others it is almost 100% like for Rio Tinto. Interestingly, for six MNEs from the top-10 the largest export market is China, where carbon pricing initiatives were not implemented until 2021, at the same time only four out of ten MNEs are from countries where nation-level carbon pricing initiatives do not exist (Australia, Brazil, China, the USA).

The list of top 10 environmentally responsible metallurgical MNEs looks different (Table 2). Top-3 are China Steel Corp. (Taiwan), Outokumpu Oyj (Finland), Alcoa Corp. (the USA). Top-10 MNEs from this list are more internationalized than top-10 largest, with an average ratio of foreign sales to total sales 74%. The largest export markets for them are Vietnam, the EU, China, South Korea, and the UK.

The difference between minority shareholders protection in both lists is not significant — 35 points in top-10 environmentally responsible firms and 34 in top-10 largest MNEs.

Data collection

For the hypotheses testing we collected data from international databases such as Thomson Reuters, the World Bank and World Economic Forum. We focused on the

¹ Thomson Reuters Database. URL: <https://www.thomsonreuters.com/en.html> (accessed: 12.07.2021).

Table 1

Top-10 metallurgical MNEs by size (total assets, bln doll. USA)

Company name	Country of headquarters	Environmental performance (E pillar in ESG rating)	The largest foreign market (% of foreign sales)	Ratio foreign sales/total sales	Total assets, reported avg (USD)	Carbon pricing (home country)	Minority shareholders protection index*
BHP Group Ltd	Australia	86.45	China	0.95	1.11993E+11	0	32
Vale SA	Brazil	79.44	China	0.88	99060023248	0	31
Rio Tinto PLC	United Kingdom	79.63	China	0.99	95726000000	1	42
Posco	Korea; Republic [S. Korea]	86.08	China	0.36	74106510010	1	37
Nippon Steel Corp	Japan	80.74	China	0.36	72992038396	1	32
Anglo American PLC	United Kingdom	86.16	China	0.95	54561000000	1	42
Baoshan Iron & Steel Co Ltd	China	60.76	N/A	0.10	53830077403	0	28
JFE Holdings Inc	Japan	75.10	N/A	0.32	42228242048	1	32
thyssenkrupp AG	Germany	77.41	USA	0.72	39961925546	1	31
Freeport-McMoRan Inc	United States of America	79.14	Indonesia	0.67	37302000000	0	35

Note: * — the score indicates the extent of minority shareholders protection taking value from 0 to 50 where 50 is the strongest protection of minor shareholders.

Table 2

Top-10 metallurgical MNEs by environmental performance

Company name	Country of headquarters	Environmental performance (E pillar in ESG rating)	The largest foreign market (% of foreign sales)	Carbon prices (host countries)	Ratio foreign sales/ total sales	Total assets, reported_ avg (doll. USA)	Carbon pricing (home country)	Minority shareholders protection index*
China Steel Corp	Taiwan	94.41	Vietnam	0	0.13	22510817848	0	37
Outokumpu Oyj	Finland	92.28	The EU	1	0.965	7060855796	1	31
Alcoa Corp	United States of America	90.15	Spain	1	0.54	17447000000	0	35
Teck Resources Ltd	Canada	89.68	China	0	0.924	29441043174	0	42
Imerys SA	France	87.89	The EU	1	0.79	8958625736	1	34
BHP Group Ltd	Australia	86.45	China	0	0.947	1.11993E+11	0	32
Newmont Corporation	United States of America	86.42	UK	1	0.988	20646000000	0	35
Anglo American PLC	United Kingdom	86.16	China	0	0.945	54561000000	1	42
Posco	Korea; Republic [S. Korea]	86.08	China	0	0.36	74106510010	1	37
Aperam SA	Luxembourg	85.46	Germany	1	0.82	5237461163	0	27

Note: * — “E” pillar in ESG rating; 0–100, where 100 is the highest.

Table 3

Data description

Variable	Variable description	Data source
<i>Dependent variable</i>		
Environmental performance (<i>EP</i>)	Environmental pillar score from ESG ranking, which has value from 0 to 100	Thomson Reuters ESG rating
<i>Independent variable</i>		
Internationalization (<i>FSTS</i>)	Ratio foreign sales to total sales which has value from 0 to 1	Thomson Reuters
<i>Institutional environment</i>		
Carbon pricing (<i>carpr_home, carpr_host</i>)	Binary variable which takes 1 if carbon pricing initiative was implemented and 0 otherwise	The World Bank
Minority shareholder's protection (<i>minshar_prt</i>)	The score indicates the extent of minority shareholders protection taking value from 0 to 50	The World Bank (Ease of Doing Business)
<i>Control variables</i>		
Size	Total assets, USD, mln	Thomson Reuters
Age	Number of years from the date of incorporation	Thomson Reuters
Development of environmental technologies (<i>envtech</i>)	% environmental technologies patents of all technologies patented in the home country	OECD
Energy Transition Index (<i>ETI_host</i>)	Aggregate index presenting host country readiness to energy transition. It takes value from 0 to 100	World Economic Forum

largest metallurgical companies which were ranked in ESG rating by Thomson Reuters. Thomson Reuters provides an extensive ESG database, which is considered one of the most comprehensive in the industry. This database covers over 6 000 public companies and includes more than 400 distinct ESG metrics. The historical data in this database goes as far back as 2002. Thomson Reuters offers the ESG Score, a measure of a company's ESG performance based on reported data available to the public. We used the E — environmental pillar from the ESG

score which includes three categories: resource use, emissions and innovation. Our sample consists of 230 metallurgical firms from all over the world and covers a four-year period from 2017 to 2020. We didn't include 2021 and 2022 because of global disruptions which significantly changed the industrial landscape. The description of variables is performed at Table 3.

Thomson Reuters database provided us also with firm-level data such as total assets, date of incorporation, foreign sales and foreign sales distribution by countries/re-

gions. Unfortunately, not all the firms report information on their export distribution by countries. Nevertheless, in most of the cases we distinguished the largest export market — the one where the largest share of sales was reported and considered that market for indicating institutional regulation in the host country.

The institutional characteristics of the home and host countries in the area of environmental protection were derived from the World Bank, OECD and World Economic Forum.

The World Bank presents a carbon pricing dashboard — an interactive online platform that shows up-to-date information on existing and emerging carbon pricing initiatives. Carbon pricing is a tool that recognizes the hidden costs of greenhouse gas (GHG) emissions and links them directly to the sources of those emissions. These costs include damage to crops, healthcare expenses associated with heatwaves and droughts, and property losses from floods and rising sea levels. Typically, this is done by placing a price on the release of carbon dioxide (CO₂). The purpose of this pricing is to shift the responsibility for the harm caused by GHG emissions back to the parties responsible, who can then take actions to avoid those emissions. Instead of mandating specific emission reductions in particular areas and methods, a carbon price provides economic incentive to emitters. They can then choose to transform their activities in order to reduce emissions, or they can continue emitting and pay for the damages caused. By employing this approach, the ultimate environmental objective can be achieved in a manner that is both flexible and cost-effective for society.

The Energy Transition Index (ETI) from WEF evaluates 120 economies on various indicators related to their energy systems. These indicators include economic development and growth, environmental sustainability, energy security and access. The assessment also considers how prepared these economies are for the transition to secure,

sustainable, affordable, and inclusive energy systems.

The Ease of Doing Business (subindex of the World Bank) provides an evaluation of minority investors protection. This score assesses the effectiveness of safeguards in place to protect minority shareholders from directors misusing corporate assets for personal benefits. Additionally, it examines the rights of shareholders, measures for governance security, and transparency requirements that minimize the possibility of abuse.

To control for an MNE's environmental performance we used as a proxy the development of environmental technologies as a percentage of all technologies. To assess technology development, indicators are created by examining patent data in various environment-related technological fields, such as environmental management, water-related adaptation, and climate change mitigation. Only higher-value inventions with patent family size of 2 are included in the counts. The data for this analysis is obtained from the Patents: Technology development dataset of the OECD Environment Database.

Method of analysis

The dataset we use is panel, however, given the nature of our dependent variable (taking value from 0 to 100) we employed Tobit regression following prior studies [Nuruzzaman, Singh, Gaur, 2020; Hennart, Sheng, Carrera, 2017]. This method allows us to properly consider the censored nature of the dependent variable. Thus, we test our hypotheses using random-effects cross-sectional panel Tobit specification [Tobin, 1958].

Below we present the descriptive statistics of our variables (Table 4) and a correlation matrix (Table 5). Due to the data availability the number of observations by each variable varies. Nevertheless, the number of observations is enough to test the model [Kyriazidou, 1997]. The average

Table 4

Descriptive statistics

Variable name	Observation	Mean	Standard deviation	Min	Max
EP	796	47.84	26.78	0.5	94.41
Carpr_home	920	0.327	0.469	0	1
Carpr_host	666	0.364	0.481	0	1
Minshar_prt	920	35.19	4.42	25	44
FSTS	920	0.434	0.361	0	1
Size	918	8.68e+09	1.53e+10	1.26e+07	1.12e+11
Age	855	33.56	27.52	1	135
Envtech	883	11.47	4.34	1.5	25.83
ETI_host	657	60.70	7.55	37	79.5

Table 5

Correlation matrix

	<i>EP</i>	<i>Carpr_home</i>	<i>Carpr_host</i>	<i>Minshar_prt</i>	<i>FSTS</i>	<i>Size</i>	<i>Age</i>	<i>Envtech</i>	<i>ETI_host</i>
<i>EP</i>	1.000								
<i>Carpr_home</i>	0.177	1.000							
<i>Carpr_host</i>	0.128	0.015	1.000						
<i>Minshar_prt</i>	0.065	0.244	-0.007	1.000					
<i>FSTS</i>	0.298	0.226	0.099	0.053	1.000				
<i>Size</i>	0.430	0.047	0.162	-0.024	0.162	1.000			
<i>Age</i>	0.161	0.201	-0.032	-0.090	0.150	0.220	1.000		
<i>Envtech</i>	0.091	0.431	-0.077	0.523	0.114	-0.045	-0.127	1.000	
<i>ETI_host</i>	-0.020	0.173	0.393	-0.021	0.149	-0.128	-0.055	0.013	1.000

environmental score of metal firms is 48 out of 100 points in the rating. The carbon pricing initiative was implemented in around 33/36% of the home/host countries, whereas the average ETI index in the largest export markets of metal firms is 61 — higher than average value of this index. In terms of size and age the metal firms in our sample are rather large and mature corporations. The internationalization measured by FSTS performs 43% average indicating again the balance of the sample. Minority shareholder’s protection of the

home country is higher than average value — 35 out of 50.

The correlation matrix presented at Table 5 demonstrates that we do not have multicollinearity problems in our model. The additional test confirmed that multicollinearity is not an issue (VIF=1.28).

Data analysis results

The results of the model testing are presented in Table 6. We conducted regression analyses on multiple models to examine

Table 6

Tobit model's testing results

Variable	Model 1	Model 2	Model 3	Model 4
Age	-0.14981**	0.08166	0.08166	0.07181
Size	8.4089***	10.0612***	10.0612***	8.0613***
Envtech	-0.65506***	0.11819	0.11819	0.15183
ETI_host	—	—	-0.4826***	-0.255423
FSTS	3.7532***	10.0979	10.0979***	1.3977
Carpr_home	—	4.9579**	4.9579**	13.6493***
Carpr_host	—	12.813***	12.813***	6.60215***
Minshar_prt	—	-0.56077	-0.56077	0.5172*
Carpr_home_internat	—	—	—	-10.9789**
_Const	—	-159.98***	-159.98***	-140.49***
Observations	534	534	527	527

Notes: “—” — the variable was not included in the model; * — $p < 0.1$; ** — $p < 0.05$; *** — $p < 0.001$.

our hypotheses. All of the models yielded statistically significant results at the 0.000 level.

In Model 1, we included control variables and FSTS. Our first hypothesis was supported, as FSTS exhibited a positive and significant association with the environmental performance of metal firms. This suggests that the extent of internationalization is positively related to environmental performance. Additionally, the size of companies displayed a predictable positive correlation with environmental performance, while the age of firms demonstrated a negative correlation. This implies that younger firms tend to perform better in terms of environmental practices compared to more mature firms. Surprisingly, the development of environmental technologies showed a negative correlation with a firm's environmental performance. This can be explained by time lag — it takes time and money to implement new technologies in business processes.

In Model 2, we introduced institutional regulation variables, specifically carbon pricing mechanisms and minority shareholders

protection. Carbon pricing mechanisms, both in the home country and in the host country, were found to be statistically significant and positively correlated with environmental performance. This finding confirms our third hypothesis, suggesting that the implementation of carbon pricing mechanisms contributes to improved environmental performance.

Model 3 yielded significant results for the hypothesis regarding minority shareholders protection. Specifically, stronger protection for minority shareholders was found to be associated with better environmental performance. Interestingly, the ETI index of the largest export market exhibited a negative and significant relationship, while the carbon pricing mechanism in the host country showed a positive and significant relationship. We attribute this to the unique characteristics of the metal industry. Carbon pricing may be a more sensitive measure for metal companies or may serve as a stronger signal of government policy, prompting immediate action from businesses. Therefore, the implementation of a carbon pricing initiative in a major export

market has an immediate impact on metal firms. On the other hand, the ETI index is a general measure that does not specifically focus on the metal industry and reflects a country's overall approach to environmental issues. Consequently, its impact on the environmental performance of metal companies may be delayed.

To examine our hypothesis on the internationalization effect, we introduced the moderation of internationalization (FSTS) on the positive relationship between carbon pricing mechanisms in the home country and environmental performance. We discovered a negative moderating effect, indicating that in the home market with strong institutional regulations, firms with a high proportion of foreign sales exhibit worse environmental performance. Thus we reject our hypothesis that internationalization enhances positive effect of MNEs' compliance with the home country regulation. On the contrary, this suggests that firms with extensive internationalization are able to evade the institutional pressures in their home country in line with the carbon leakage logic, thus potentially compromising their environmental performance.

In conclusion, our findings highlight the importance of minority shareholders protection and institutional regulation in promoting environmental performance. Additionally, our examination of the "carbon haven" effect reveals the complex relationship between internationalization and environmental performance in the context of institutional regulations.

FINDINGS AND DISCUSSION

The pressure exerted by the external environment, including government climate policies, compels MNEs in the metal industry to respond either proactively or reactively. In this study, we shed light on the strategies employed by MNEs in this sector, confirming that both approaches are adopted. Our findings support the notion that

climate regulations in the home country, such as carbon pricing, can significantly impact the environmental performance of MNEs. We discovered a strong positive correlation between the implementation of carbon pricing initiatives and firms' environmental performance. Additionally, previous studies have also demonstrated the positive influence of carbon pricing initiatives in the host country on MNEs' environmental actions.

Furthermore, we observed a negative correlation between MNEs' environmental performance and the Energy Transition Index of the host country. This finding lends support to the "carbon haven" hypothesis and suggests that the impact of this indicator on the metal industry may be limited. Interestingly, we found that MNEs can effectively evade carbon taxes by relying on their export markets. The extensive internationalization of metallurgical firms negatively moderates the positive relationship between stringent climate regulations in the home country and their environmental performance, although we expected MNEs' dependence on home country resources.

Consequently, we argue that despite the effectiveness of climate regulations at the country level, MNEs can derive benefits from more lenient environmental policies in other countries, which, in turn, benefit from firms' imports and investments. As metallurgical firms are bound to the home country and make significant contribution to domestic economic growth, internationalization can also increase their bargaining power domestically and mitigate the stringency of domestic environmental policy. So, MNEs navigate between stakeholder pressures and economic gains. As noted by [Bu, Wagner, 2016], empirical evidence supports both arguments, but studies often fail to adequately account for other potential influences, including industry-specific factors. In our case, the metals industry plays a significant role and exposes the multifaceted relationship between internationalization and environmental performance.

The significance of the institutional environment in the home country was further confirmed by the importance of minority shareholders' protection. Although minority shareholders may not directly influence MNEs' strategic decisions, their engagement in dialogue with top-managers and other stakeholders indirectly influences the environmental practices of MNEs [Stout, 2012]. Therefore, the protection of shareholders' rights promotes active involvement of various stakeholders in the company's decision-making processes.

The relationship between MNEs and their sustainability or environmental performance has long been a subject of discussion in the literature [Wood et al., 2021]. Our study provides evidence supporting a positive correlation between a firm's engagement in the global economy and its environmental performance. We posit that operating in different international markets subjects metallurgical MNEs to additional stakeholder pressures, compelling them to be mindful of their environmental practices. Many MNEs proactively introduce green innovations, forge partnerships, and engage in other forms of cooperation to achieve sustainable goals. Though, further research is needed to address possible solutions to manage the risk of carbon leakage through MNEs' trade and investment strategies.

CONCLUSION

Despite advancements in the establishment of national climate policies, the global regulatory framework remains fragmented, with significant disparities among countries in terms of the ambition and stringency of these policies. Our research confirms that MNEs can adopt diverse strategies, which can lead to two contrasting outcomes. On one hand firms prioritize environmental responsibility as a means to gain a competitive edge. On the other hand, firms seek advantages by operating in locations with less stringent environmental policies. Our

results challenge conventional wisdom on positive correlation between internationalization and environmental performance by exploring the dark side of MNEs internationalization from the point of view of their contribution to the climate goals.

Our results suggest the carbon leakage logic behind the internationalization agenda of metallurgy firms, yet we do not specifically prove pollution haven hypothesis, because we do not examine the geographical composition of firms' international exposure. Future studies can contribute to this debate and examine whether stringent home-country regulations indeed make metallurgy firms escape to locations with more favorable environmental regulations. This goes in line with the appeal of other scholars [Nippa, Patnaik, Taussig, 2021] to account for firm- and industry-level specifics in examining the strategic response of MNEs towards environmental regulations. Adding other institutional variables, as well as conducting longitudinal studies to account for the dynamics of environmental regulations would definitely benefit the development of this topic.

Our research focuses on the environmental performance of the scarcely studied metallurgy industry that is considered to have a controversial position in the climate action debate. Metals and mining companies are concerned over the significant effect that carbon regulation can have on their profitability [Tost et al., 2020]. Along with that, as highlighted by scholars, the metals and mining industry is among the major contributors to global carbon footprint, yet the economic contribution of the industry is respectively substantial, and compared to it, the footprint is not so drastic. Meanwhile, in the long run this industry is to play an essential role in transitioning to a low-carbon future, and is expected to benefit from tax on carbon emissions [Cox et al., 2022]. This intricacy reinforces the need for in-depth investigation of the environmental strategies of metallurgy firms that happen to be sometimes intertwined with their in-

ternational strategies. This investigation is crucial in terms of formulating policy implications that include combining efforts of governments and business in climate action.

Our study supports the idea that climate regulations and institutional factors in the home country play a significant role in shaping the environmental performance of metallurgical firms. Climate regulations, such as the implementation of carbon pricing initiatives, serve as catalysts for firms to enhance their environmental practices, particularly when they export to markets

with similar regulations. Additionally, institutions that protect minority shareholders' rights also hold great importance in driving the advancement of environmental performance among MNEs. When "the rules of the game" [North, 1991] prioritize the protection of minority shareholders, both MNEs and society as a whole can achieve more sustainable outcomes. Further research can investigate how the agency problem between minority investors and major shareholders can shape firms' environmental performance.

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**Влияние институтов и интернационализации
на экологические показатели многонациональных
металлургических компаний**

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Цель исследования: в статье рассматривается взаимосвязь между институциональной средой, уровнем интернационализации многонациональных металлургических компаний и их экологическими показателями. Изучаются вопросы влияния уровня интернационализации и качества институтов на домашнем и зарубежном рынках на экологические показатели многонациональных металлургических компаний, а также возможности снижения институционального давления на домашнем рынке за счет международной экспансии.

Методология исследования: статья основана на количественном анализе с использованием панельной регрессии. Анализируются данные по крупнейшим многонациональным металлургическим компаниям из различных стран за период с 2017 по 2020 г. Выбор отрасли связан с ее значительным весом в структуре глобальных выбросов парниковых газов.

Результаты исследования: показано, что интернационализация и жесткая климатическая политика на домашнем рынке положительно влияют на экологические показатели многонациональных металлургических компаний. Кроме того, выявлено, что общие институциональные факторы в стране базирования, такие как защита миноритарных акционеров, также способствуют улучшению экологических показателей деятельности компаний. Тем не менее интернационализация негативно модерирует связь между жестким климатическим регулированием на домашнем рынке и экологическими показателями. **Оригинальность и вклад авторов:** в работе сделан вывод о том, что, несмотря на общую тенденцию к улучшению экологических показателей, многонациональные металлургические компании с более высокой долей продаж на зарубежных рынках демонстрируют относительно худшие экологические показатели. Это отражает логику следования в так называемые углеродные гавани в контексте ужесточения климатического регулирования на домашнем рынке.

Ключевые слова: МНК, экологические показатели, интернационализация, «углеродная гавань», металлургическая отрасль, ESG.

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