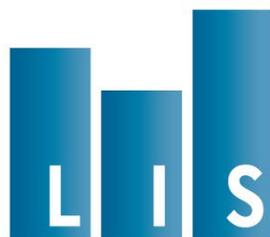# LIS
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Income Inequality, US MNEs and Green Technology Innovation: Evidence from OECD

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Abstract

We are exploring the interplay between inequality and foreign direct investment (FDI) and green technology innovation, an area that remains underexplored in international business (IB) research. This study examines how green technology innovation moderates the relationship between FDI, proxied by the performance and operational outcomes of majority-owned U.S. foreign affiliates, and income inequality, measured by the Gini coefficient of equivalised disposable income from the Luxembourg Income Study (LIS) database. We employ OECD patent data on green innovations to construct a panel dataset of 28 high-income OECD countries from 2000 to 2020. Using fixed-effects panel regressions and quantile models with bootstrapped inference, the results indicate that FDI has a significant inequality-reducing effect, and green innovation moderates this relationship, reducing income inequality. Firm investment, profitability, efficiency, and innovation interact with green innovation to reduce inequality, highlighting the role of MNEs in fostering equitable outcomes. These findings contribute to a better understanding of IB activity by unpacking the interdependent dynamics between firm performance and national competitiveness, offering policy insights to promote FDI and green innovation and mitigate inequality.

Keywords: Multinational enterprises, Green innovation, Income inequality, Disposable household income, Luxembourg Income Study, OECD, Moderating effects, Fixed-effects, Quantile regression.

JEL: F23, O33, D63

1. Introduction

Rising income inequality represents one of the most pressing grand societal challenges of our time, intersecting in ways that profoundly impact multinational enterprises (MNEs) and host economies alike (Van der Straaten et al., 2023). In high-income OECD countries, where inequality has widened despite economic growth, the role of foreign direct investment (FDI) in exacerbating or mitigating these disparities remains underexplored, particularly when mediated by green technology innovation (UNCTAD, 2025). The rise in within-country inequality is a persistent and widely recognised challenge, prompting concern among scholars and policymakers across both advanced and developing nations (Erfurth, 2024). MNEs are increasingly positioned as agents of change, transferring knowledge and technologies that could foster equitable growth (Buckley & Casson, 2021). Despite advancements in technology, market-oriented reforms, and global economic integration, the impact of the expanding business and corporate landscape on income distribution across all segments of society remains a subject of intense debate (Ghauri, 2022). While multinational companies may benefit the host economy, it remains unclear whether these gains are shared equally or whether some groups benefit while others are left worse off (Rygh et al., 2022).

This study addresses this gap by examining the interdependent relationship between FDI, here proxied by the performance of majority-owned U.S. foreign affiliates, and income inequality, with a focus on how green technology innovation moderates this dynamic, thereby advancing our understanding of MNEs' contributions to national competitiveness and sustainability in its core economic, social, and environmental dimensions within high-income OECD economies (Vona & Patriarca, 2011). While some studies find FDI narrows income gaps by promoting economic integration (e.g., in emerging markets), others highlight how it may widen disparities in advanced economies by favouring skilled labour and capital-intensive industries (Giuliani, 2018). Scholars have highlighted that MNEs affect income distribution in host countries, while existing levels of inequality can, in turn, influence the volume and characteristics of incoming foreign investment (Taylor & Driffield, 2005). MNEs generally boost growth and efficiency, which often leads to their impact on inequality being overlooked (Figini & Goerg, 2011; Taylor & Driffield, 2005). Understanding the root causes of inequality is essential for developing effective policy measures that promote a more equitable society.

MNEs deploy firm-specific intangible assets internally into their foreign-market operations to compete with domestic firms (Buckley & Casson, 2020). These competitive

advantages are enhanced through MNEs' innovation processes to create channels for international economic involvement and economic rents (Dunning, 1988). Amid growing environmental concerns, green innovation has become a strategic objective for businesses pursuing sustainable growth (Amendolagine et al., 2023; Niu et al., 2024). Technological innovation can contribute to long-term value creation for firms (Kim et al., 2021). Thus, FDI must engage proactively or reactively in each country in which it operates, particularly in relation to economic opportunities and nation-state policy responses, pursuing both sustainability and competitiveness objectives in response to green challenges (Benito & Meyer, 2024). Moreover, scholars argue that a country's firms derive their competitive advantage from the nation's ability to organise and exploit created assets more efficiently than competitors (Dunning & Narula, 1995). However, the implications of such interactions for income inequality remain underexplored and insufficiently addressed in the literature. We address this gap by examining whether the development of green technology innovation (hereafter, green innovation) at the national level moderates the relationship between MNEs and income inequality in host countries. Green technology innovation, as a key aspect of green innovation, contributes not only to environmental protection but also to improved economic performance, making it a vital driver of sustainable development (Dangelico et al., 2017; Rennings et al., 2006; Zhang et al., 2024).

The transfer of propriety technological know-how and the diffusion of resulting technological advancements within host countries do not always yield equitable benefits, thereby reinforcing existing income disparities (Cisneros Chavira et al., 2023). Acemoglu et al. (2012) highlight how technical change such as the shift toward the green technology frontier, can reshape economic structures and potentially widen income disparities if not supported by inclusive policies. Geels (2002) suggests that green technology may either perpetuate or challenge existing social inequalities, depending on its accessible within society. Still, its deployment through FDI may disproportionately favour skilled workers or wealthier regions, leaving lower-income groups behind (Acemoglu et al., 2014; Piketty & Zucman, 2014). This prompts critical inquiry into whether FDI and green technology innovation development serve to mitigate or exacerbate income inequality, and how their interplay shapes patterns of income distribution across countries (Acemoglu et al., 2012). Understanding this relationship is essential to encouraging public policies that support green foreign direct investment (FDI) and nation-led green technology initiatives to foster sustainability and reduce economic disparities.

Despite these insights, international business (IB) literature has paid limited attention to the moderating role of green innovation in the FDI-inequality relationship, with most studies focusing on direct effects or emerging markets. This study fills this void by leveraging a panel dataset of 28 high-income OECD countries from 2000 to 2020, drawing on Luxembourg Income Study (LIS) data for inequality, U.S. Bureau of Economic Analysis (BEA) metrics for FDI performance (e.g., investment, profitability, efficiency), and OECD patent indicators for green innovation. By employing fixed-effects regressions and quantile models, we unpack the mechanisms through which FDI and green innovation jointly shape inequality, offering implications for MNE managers and policymakers aiming to align globalisation with the UN Sustainable Development Goals (SDGs), particularly SDG 10 (reduced inequalities) and SDG 9 (industry, innovation, and infrastructure).

This paper distinguishes itself from the existing literature in four respects. First, it focuses on the effects of FDI and green technology innovations on income inequality, rather than on growth, which have been extensively elaborated in the literature (Doh, 2019). Second, it explores the interaction between FDI and national economies, i.e., the interdependent relationship between firm performance and the political economy of national competitiveness from within countries (Rygh, 2021). Third, it concentrates on developed countries only, namely the OECD-28 group over the last twenty years, on which the evidence remains scarce with most literature comprising conceptual papers and reviews (Narula & Van der Straaten, 2021; Van der Straaten et al., 2023). Fourth, it tries to identify the separate effects of FDI, particularly through the performance and operational outcomes of U.S. majority-owned foreign affiliates, to account for heterogeneity across countries within the OECD, and, finally, to measure the contribution of each factor to observe changes of inequality among countries and over time using micro-data from the Luxembourg Income Study (LIS) on the distribution of disposable income after redistribution through taxes and transfers (Pearce & Tang, 2021).

Based on the above discussion, the following research questions (RQs) are framed:

RQ1 – Does the enhancements of green technology innovation influence income inequality?

RQ2 – Whether the rise of FDI, measured by the performance and operational outcomes of US majority-owned foreign affiliates, affects income inequality in host countries?

RQ3 – Does the development of green technology innovation moderate the relationship between FDI and income inequality?

The results suggest that the inequality implications of FDI are contingent upon green technological innovation. When green technological innovation is high, FDI is more likely to reduce income inequality. Moreover, the results highlight the pivotal role of firm profitability in shaping this relationship. Overall, this study underscores the importance of green technology innovation and the presence of FDI and MNEs in host countries to mitigate economic inequality, offering novel insights into the interplay between FDI, green innovation, and economic outcomes.

The rest of the paper is organised as follows. Section 2 establishes the links between income inequality, FDI, and green technology innovation, drawing on the existing literature and articulating the research hypothesis. Section 3 presents the empirical model, data set, and outlines the methodology adopted in this study. Section 4 presents and discusses the results. Section 5 presents the study's overall conclusions on the research topic and offers valuable suggestions for further research.2. Literature review

2. Literature review and hypothesis development

2.1 The relationship between foreign direct investment and income inequality

Foreign investment entails the establishment of business operations or the acquisition of assets in foreign countries, facilitating international technology diffusion and contributing to productivity growth in developed countries (Xu, 2000). The presence of MNEs is often associated with positive macroeconomic outcomes, including increased capital formation, employment generation, and embodied knowledge spillovers enhancing effects in recipient countries (Borensztein et al., 1998; Hejazi & Safarian, 1999). Despite differences in economic conditions and levels of development, increased foreign investment is consistently associated with higher wages and wider wage gaps between foreign-owned and domestic companies (Aitken et al., 1996). Some scholars maintain that skill-biased technological change and global competition have shaped wage structures and employment composition, while also contributing to increased wage inequality (Agénor & Aizenman, 1997; Bound & Johnson, 1992; Feenstra & Hanson, 1997). The empirical evidence indicates that employment changes in a small group of trade-impacted concentrated industries can explain not only part of the aggregate rise in wage inequality in advanced economies, but also some of the differences in the trends in wage inequality across metropolitan areas (Borjas & Ramey, 1995).

The introduction of new technologies into an economy is expected to affect labour demand, as firms that adopt advanced technologies tend to rely more on skilled than unskilled labour (Figini & Görg, 1999). Using UK panel data, Taylor and Driffield (2005) found that FDI has a significant impact on the labour market, particularly in contributing to wage inequality. Herzer and Nunnenkamp (2013) further confirm that both inward FDI and outward FDI, on average, have a negative long-run effect on income inequality in Europe. Moreover, income inequality, by fuelling social discontent, may contribute to socio-political instability. This instability, in turn, generates uncertainty within the politico-economic environment, thereby discouraging investment (Alesina & Perotti, 1996). Asteriou et al. (2014) empirically examined the relationship between income inequality and various measures of globalisation, such as trade and financial indicators within the European Union, concluding that FDI contributes most significantly to rising inequality.

Economic development is frequently linked to globalisation, especially through the impact of FDI (Antràs et al., 2017). The theoretical literature demonstrates that FDI may increase, decrease or have a non-linear impact on inequality (Huang et al., 2020; Ofori & Asongu, 2024). Thus, empirical research outcomes remain varied and inconclusive. Some studies highlight positive impacts (Jaumotte et al., 2013), others indicate that FDI does give rise to more unequal income distribution (Chintrakarn et al., 2012; Pan-Long, 1995; Wang et al., 2023), and some find no statistically significant outcomes (Blonigen & Slaughter, 2001; Milanovic, 2005). Soto et al. (2024) provide evidence that FDI may be growth-enhancing and reduce inequality, with these effects likely being more pronounced in the presence of lower tax burdens. Hence, we posit the following hypothesis:

H1. Increased inward FDI (as measured by the firm performance indicators) reduces income inequality of the host country, *ceteris paribus*.

2.2 The relationship between green technology innovation and income inequality

One strand of the literature views innovation as a determinant of inequality, highlighting the impact of imbalances in labour market structures and wage distributions (Acemoglu, 2002). The empirical literature highlights significant links between inequality and technological change, primarily through a shift in labour demand from lower-skilled workers to a more highly qualified, knowledge-based workforce. In advanced economies, rapid secular growth in the

demand for more educated workers appears to be the driving force behind observed changes in the wage structure (Katz & Murphy, 1992).

Technology remains the main engine of progress, driven by public and private R&D investments and accelerated through innovation-led competition (Gries et al., 2017). Evidence suggests that rising R&D investment and stronger patent protection can exacerbate income inequality by increasing the returns to capital (Jones & Williams, 2000). Aghion et al. (2018) reported that innovation increases an entrepreneur's profitability and likelihood of moving into higher income levels, with an even greater impact on the earnings of firm owners.

Antonelli and Gehringer (2017) argue that increasing income inequality is the consequence, rather than the cause, of slow growth and, more specifically, of the slowing pace of technological change. When capital markets are imperfect, there is not necessarily a trade-off between equity and efficiency (Aghion et al., 1999). As observed by Aghion et al. (1999), innovation, particularly by new entrants, is positively associated with social mobility, but this association is weaker in local areas with more intense lobbying.

Another strand of literature has drawn attention to the fact that inequality explains innovation across countries (Weinhold & Nair-Reichert, 2009). That implies that income distribution affects the development and diffusion of technologies through multiple channels. Melki (2022) concludes that inequality substantially decreases investment in countries with poor property rights and inequality associated with a weak rule of law increases rent-seeking by the wealthy. Within rich countries, significant disparities in the capacity to generate environmental innovations appear to be linked to levels of inequality, with greater inequality impeding both the development and diffusion of environmental technologies (Vona & Patriarca, 2011). Accordingly, income inequality exerts a contrasting influence on environmental regulations and the demand for green products, both of which play a crucial role in driving the generation and adoption of eco-efficient innovations (Beise & Rennings, 2005). Boyce (1994) has argued that greater inequalities of power and wealth lead, all else equal, to more environmental degradation.

Bringing these insights together, we contribute to this literature by exploring the determinants of income inequality rather than its effects. We draw attention to the role of innovation – specifically green innovation – in assessing income inequality across countries. Building on the preceding discussion, we propose the following hypothesis:

H2. Increased green technology innovation reduces income inequality in the host country, *ceteris paribus*.

2.3 The relationship between foreign direct investment, green technology innovation, and income inequality

We outline two distinct perspectives on how technological innovation influences the relationship between FDI and income inequality: one suggests that innovation weakens this relationship, while the other argues that it strengthens it. There is reason to believe that green technology innovation is influenced by mechanisms similar to those that drive innovation more generally.

In general, innovation can lead to increased market concentration of some firms relative to others, enabling innovators and firms with ownership rights to secure a disproportionate share of income and wealth, thus deepening existing income inequality (De Loecker et al., 2020). The impact of a particular innovation on inequality depends on who holds the property rights to the innovation and how they choose to exploit them (Zingales, 2017). Technological innovations can shift the bargaining power between workers and capital owners, thereby affecting workers' earnings (Autor et al., 2020). Others claim that technological change can have benign effects on the labour share and tends to be labour-intensive rather than capital-intensive across European regions when driven by the skills and learning processes of the workforce (Pialli, 2025).

Moreover, innovation can shift power dynamics among market participants, reshape market functioning, and alter returns associated with different attributes of market participants (Aghion & Griffith, 2024). Evidence suggests that technological changes in production have altered the relative wages of skilled versus unskilled workers (Krusell et al., 2000). Investments in new computer technologies have raised the wage premium for high-skilled workers relative to their lower-skilled counterparts (Machin & Van Reenen, 1998). Countries undergoing significant technological change often experience job displacement and rising wage inequality (Berman et al., 1998). Therefore, workers' adaptability to new technologies and production processes affects income distribution, if the expansion of access to higher education has a greater effect on reducing the skill premium in the presence of capital-skill complementarity (Taniguchi & Yamada, 2022). On the contrary, the evidence by Arundel et al. (2019) claims

that innovation in public sector management has likely contributed to reductions in inequality by enhancing the state's efficiency in providing welfare and public goods.

Innovation can affect FDI attraction and influence income distribution through market-based and government-driven channels, provided that the necessary conditions are in place. The ultimate impact of innovation on FDI and distributional outcomes depends on the interplay among these channels. Li et al. (2021) report that FDI is positively associated with innovation performance and vice versa in OECD countries. Therefore, governments can strengthen intellectual property protection to attract FDI for economic gains within an environment that supports and promotes sound, credible institutions, education, and technological development (Adams, 2008). Knowledge spillovers represent the primary market failure that economists have emphasised when advocating for government intervention in the innovation process (Bloom et al., 2019). Tax relief on patenting and direct public funding appear to be the most effective measures for increasing firms' R&D spending in innovation and research investments in new technologies (Dechezleprêtre et al., 2023; Williams, 2017). There is evidence that positive productivity spillovers from FDI occur through contacts between foreign affiliates and their local suppliers in upstream sectors (Javorcik, 2004). Empirical studies have confirmed that FDI can generate spillovers in host economies, boosting productivity and invention efforts across countries (Branstetter & Saggi, 2011; Grafström, 2018). At the same time, FDI spillovers are particularly important in high-tech sectors, and small firms with low productivity benefit more from them than larger, more productive firms do (Keller & Yeaple, 2009).

As countries increasingly compete to attract MNEs based on the potential benefits their presence and activities may bring to host countries (Cantwell & Iammarino, 2000), strengthening innovation-led strategies to enhance FDI attractiveness can simultaneously contribute to widening income gaps. In a review of the impact of FDI on domestic innovation in the UK, Crescenzi et al. (2015) reported that domestic firms active in sectors with greater MNE investment show a stronger innovative performance in both manufacturing and services. Foreign firms can facilitate the diffusion of environmentally friendly knowledge and foster environmental innovation by promoting green technological spillovers in host countries (Benito & Meyer, 2024).

Costantini and Mazzanti (2012) demonstrated that public policies and private innovation patterns both increase efficiency in the production process through various complementarity mechanisms, thereby turning the perception of environmental protection

actions as a production cost into a net benefit. Green technologies seem to generate greater technological spillovers than non-green technologies and have a larger, more pervasive impact on subsequent inventions (Barbieri et al., 2020). Green FDI enhances the overall sustainability orientation and green innovation capacity of MNEs, and their specialisation in green technologies (Amendolagine et al., 2021). It has been shown that inclusive innovation encourages the development and adoption of green technologies that reduce environmental impact while creating economic opportunities across diverse social groups (Hardi et al., 2025). Dechezleprêtre et al. (2022) found no evidence that the European Union Emissions Trading System (EU ETS) has led to a displacement of carbon emissions from Europe toward the rest of the world, including to countries with lax climate policies and within energy-intensive companies.

This study explores the intricate relationship between FDI and income inequality in OECD countries, focusing on the role of green technology and innovation in shaping these outcomes. For this synergy to succeed, we expect governments to enforce property rights and ensure a stable business environment, thereby enabling private companies to drive innovation, promote competition, foster entrepreneurship, and enhance resource efficiency. Therefore, we put forward the following hypothesis:

H3. Green technology innovation moderates the relationship between FDI and income inequality in such a way that green technology innovation strengthens the role of FDI in reducing income inequality of the host country, *ceteris paribus*.

3. Methodology and Data

3.1 Model Specification

We estimate panel regression models to examine income inequality as a function of FDI, green technology innovation, and relevant control variables. The analysis is based on the estimation of the following model specification:

$$y_{it} = \beta_0 + \beta_1 fdi_{it} + \beta_2 inov_{it} + \beta_2 X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \tag{1}$$

where subscripts i denote the country and t represents the year. y_{it} denotes income inequality, fdi_{it} represents foreign direct investment, $inov_{it}$ captures green technology

innovation, and X_{it} is a vector of control variables. The terms μ_i and λ_t denote country-specific and time-specific fixed effects, respectively, while ε_{it} is the idiosyncratic error term.

To explore the moderating effect of FDI and green technology innovation, the model is extended by introducing interaction terms as follows:

$$y_{it} = \beta_0 + \beta_1 fdi_{it} \: x \: inov_{it} + \beta_2 X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \qquad (2)$$

This specification allows us to assess whether the impact of FDI on income inequality depends on the level of green technological innovation within each country. The first equation estimates the direct effects of these variables on income inequality, while the second equation incorporates interaction terms to assess the moderating effects of FDI and green technology innovation on income inequality. To complement these results, we employ a quantile regression model to examine the heterogeneous effects of FDI and green technology innovation across income inequality levels. We specify the conditional quantiles function for quantile as follows:

$$Q_\tau \left(y_{it} | \alpha_i, x_{it} \right) = \alpha_i + x' \: \beta(\tau) \qquad (3)$$

where the countries and time are indexed by subscripts i and t, respectively. yit is inequality indicator which refers to the income inequality at the country level. αi is the time-invariant country-fixed effect. $\beta(\tau)$ *is* the parameter of interest varying with quantile (0,1). $x'it$ is the set of control variables. The individual regression coefficients of FDI and green technology innovation are the parameters of interest in this study. Table 2 summarises all variables.3.1.1 Dependent variable

We use microdata from the Luxembourg Income Study and gather data on household income inequality (Atkinson, 2004; Wang et al., 2014). The dependent variable is income inequality measured by the Gini index of disposable household income. It is obtained by subtracting income taxation and social security contributions from gross income. The Gini index is calculated for the entire household and is based on disposable household income. Income is 'post-tax', and measured after taxes have been paid, after deduction of taxes, and after most government benefits have been received. Incomes are top and bottom-coded by replacing negative values with zeros and setting boundaries for extreme values of log income. Incomes have been equivalized and adjusted to account for the fact that people in the same household can share costs such as rent and heating. Incomes are equivalized by dividing each household

observation by the square root of the number of household members. Income data is converted from local currency into international US dollars by dividing by the LIS purchasing power parity (PPP) factor using 2017 as the base year. All Gini coefficients are obtained by using Stata's *ineqdec0* function. Weights are set as the product of the number of household members and the normalised household weight. This function returns the Gini coefficient, which measures inequality on a scale from 0 to 1. Higher values indicate higher inequality, whereas lower values indicate lower inequality.

3.1.2 Explanatory variables

Foreign direct investment

Foreign direct investment is proxied by the operational outcomes of US majority-owned subsidiaries. For the main explanatory variable in our study, we employ four alternative indicators to distinguish between different firm performance and operational outcomes of US majority-owned foreign affiliates. First, we employ a measure of capital investment by US MNEs (Slaughter, 2000). We measure the investment capacity of US majority-owned foreign affiliates by dividing total capital expenditures by the net value of property, plant, and equipment denoted MNE investment. Capital expenditures to net property ratio is a financial metric that compares a company's investments in property, plant, and equipment to the net value of its property. Second, our analysis considers the financial performance of US majority-owned foreign affiliates, denoted MNE profitability. It measures a firm's profitability relative to its total assets. We employ a return-on-assets proxy for firm profitability, calculated as net income divided by total assets (Gomes & Ramaswamy, 1999). Third, MNE efficiency captures the operational outcomes of the firm by computing the return on sales ratio as a proxy of firm efficiency (Daniels & Bracker, 1989). This indicator is obtained by dividing operating profits (value added) by sales to measure how efficiently a firm turns sales into profits. Fourth, our next variable is MNE innovation capturing the firm's technological assets and innovation capacity (Hitt et al., 1997; Kim et al., 2021). This variable is used to control for the effects of intangible assets on firm performance and is computed as the ratio of research and development expenditures to a firm's total number of employees. The use of this ratio avoids problems associated with an artificial relationship between firm size, which is measured by firm sales.

Green technology innovation

This study aims to examine the direct effects and moderating effects of FDI and green technology innovation on a nation's income inequality. In this study, we use two indicators for assessing the development of environment-related technologies and evaluating countries' innovative performance. These indicators are constructed by measuring inventive activity using patent data of higher-value inventions across a wide range of environment-related technological domains, including environmental management, water-related adaptation technologies, and climate change mitigation. Patent data presents several advantages to other alternative measures of innovation. Unlike data on R&D expenditures, which capture only the inputs to the innovation process and may not necessarily embody new technologies, patent data is often used as a measure of technological innovation because it reflects the tangible outputs of the inventive process (Griliches, 1990). Green technology innovation is measured by the share of patents in environmental technologies in a country's total portfolio and reflects the extent to which a nation's innovative orientation is directed toward specialisation in environmentally beneficial technologies (Bettarelli et al., 2024). A higher value means the country's innovation system is more oriented toward environmental or sustainable technologies.

Control variables

Finally, in all regressions we add several covariates that are expected to affect income redistribution. We control for the level of economic development by employing the log of real GDP per capita in constant 2017 US dollars (denoted as income per capita) (Asteriou et al., 2014). Periods of high economic growth have been argued to raise top income shares at the expense of the poor, and trade openness has no clear distributional impact (if anything openness reduces top shares) (Roine et al., 2009).

Trade openness plays a central role in growth, regional integration, and global competitiveness (Yeboah et al., 2025). Controlling for trade openness reduces the potential omitted variable bias in our empirical specification. Our analysis considers the effect of international market integration by including the percentage of imports plus exports to GDP (denoted as trade openness). The next control variable in our specification is the youth population dependency ratio, also known as the age dependency ratio. This ratio is calculated as the percentage of individuals aged below 15 or above 64 who are typically not in the labour

force (dependents), relative to those of working age. A high (low) age dependency ratio means that fewer working-age individuals are supporting more (fewer) dependents. As highlighted in the literature, demographic factors are a fundamental driver of the scale of social benefits and public pension systems (Kammas & Sarantides, 2019).

3.2 Data

Our dataset comprises 28 developed countries from 2000 through to 2020, though not all variables are available for all countries in all periods[1]. Table 2 provides definitions and data sources of all variables. We construct the income inequality dataset using standardised household survey microdata from the Luxembourg Income Study (LIS), accessed through the LISSY platform[2] (Luxembourg Income Study, 2024). As interest in comparing inequality levels and trends across countries grows, several cross-national inequality databases have emerged. These databases vary significantly in their objectives, scope, data sources, selection criteria, and documentation quality (Ferreira et al., 2015). The contribution of the Luxembourg Income Study (LIS) lies in its provision of high-quality microdata, which has been instrumental in shaping the widely accepted understanding of cross-national differences in income inequality among OECD countries (Atkinson, 2004). Data on the performance and operational outcomes of MNEs are sourced from the Bureau of Economic Analysis (BEA) statistics on the foreign activities of U.S. multinational enterprises, specifically focusing on U.S. majority-owned foreign affiliates. Our approach leverages data maintained by BEA, which provides detailed accounting information about FDI, allowing measurement of foreign activities for each country in which US-based MNEs operate. Data on green innovation are from the OECD Green Growth Indicators database, which contains indicators for monitoring progress towards green growth to support policymaking.

Tables 3-4 provide the descriptive statistics and correlation matrix for all variables under scrutiny. All variables are expressed in logarithmic form to reduce skewness and

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[1] Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Lithuania, Luxembourg, Netherlands, Norway, Poland, Slovakia, Slovenia, South Korea, Spain, Sweden, United Kingdom.

[2] The Stata code used to extract data from the Luxembourg Income Study (LIS) database is available upon request. We gratefully acknowledge *Pablo Arriagada* from *Our World in Data* at Oxford University for his support.

heteroscedasticity. Income inequality has a mean of –1.205 and a standard deviation of 0.133, suggesting moderate cross-country variation. Green technology innovation has an average value of 2.366, indicating that approximately 10% of all domestic inventions are environmentally related. Firm-level indicators display substantial heterogeneity and vary widely across the sample, reflecting differences in corporate performance and innovation capacity among MNEs across host countries. The control variables exhibit relatively low dispersion, reflecting stable macroeconomic conditions across predominantly high-income and globally integrated economies in the sample. The age dependency mean value of 3.915 translates into an average age dependency ratio of about 50%, meaning there are roughly 50 dependents (youth and elderly) for every 100 working-age individuals.

Regarding the pairwise correlation coefficients among all variables, income inequality is significantly negatively correlated with income per capita and trade openness, suggesting that more developed and open economies tend to experience lower inequality. It also shows a positive correlation with firm investment and firm efficiency, suggesting that capital-intensive, efficient firms may coexist with higher inequality. The correlation analysis also indicates negative, statistically significant relationships between firm indicators and income inequality, suggesting that higher levels of firm profitability and innovation are associated with lower inequality across countries. Green technology innovation shows a negative association with firm-level indicators and the negative and statistically significant relationship with firm innovation indicates. In particular, the negative and statistically significant relationship with firm innovation suggests that, within the sample, countries attracting higher levels of R&D expenditures from MNEs tend to exhibit lower levels of green technology–oriented innovation, and vice versa. The relatively high correlations among some variables justify the use of fixed-effects and robust estimation techniques in the regression analysis to mitigate potential multicollinearity.

3.3 Estimation strategy

We estimate panel regression models to explain income inequality as a function of FDI, using measures of firm performance and a set of control variables. Starting with the full set of variables, we first estimate the direct effects by comparing regression results across several

linear panel-data estimation techniques, primarily using fixed-effects estimators to control for unobserved heterogeneity across countries and over time. These include pooled OLS with clustered standard errors to account for heteroskedasticity and serial correlation (White, 1980), median (Least Absolute Deviation) quantile regression with bootstrapped standard errors (Koenker & Bassett, 1978), random-effects Generalized Least Squares (Swamy & Arora, 1972), two-way fixed-effects models with both unit and time dimensions (Nickell, 1981), the within-estimator fixed-effects regression (Arellano, 1987), and the Driscoll–Kraay panel fixed-effects estimator, which provides robust standard errors corrected for cross-sectional dependence (Driscoll & Kraay, 1998).

Next, we estimate the moderating effects using the Driscoll-Kraay estimator, which provides robust standard errors in linear panel-data models by adjusting for heteroskedasticity, serial correlation up to a finite lag, and cross-sectional dependence. This approach extends the standard fixed-effects framework by employing nonparametric covariance matrix estimation techniques, allowing for inference that remains valid in the presence of both spatial and temporal dependence (Hoechle, 2007). Standard techniques that fail to account for this dependence will yield inconsistent standard errors (Kapetanios et al., 2011). Additionally, the estimator accommodates missing observations and can be applied to both balanced and unbalanced panels, enhancing its applicability across a wide range of empirical settings (Vogelsang, 2012).

We further employ a panel quantile method with fixed effects, as proposed by Machado and Santos Silva (2019). This approach is a restricted version of regression quantiles that avoids the occurrence of crossing while maintaining sufficient modelling flexibility (He, 1997). Because this method is based on conditional means, it is particularly useful for panel data models with individual effects, thus controlling for unobserved individual heterogeneity and estimating conditional heterogeneous covariance effects of carbon emissions drivers. While providing information on how the regressors affect the entire conditional distribution, the inferential procedure facilitates the estimation of complex models. It has the essential feature of being robust by leading to estimates of the regression quantiles that do not cross, a crucial requisite often ignored in empirical applications (Chernozhukov & Hansen, 2008). Moreover, this estimation method uses stronger model assumptions to overcome the incidental parameter problem of quantile regressions with fixed effects (Canay, 2011; Lamarche, 2010; Lancaster, 2000).

4. Findings and discussion

4.1 Direct effects

The empirical analysis begins with examining the direct effects of FDI and green technology innovation on income inequality, as reported in Table 5 (panel regression results) and Table 7 (panel quantile regression results). Across various specifications, including pooled OLS with clustered standard errors, median quantile regression with bootstrapped errors (200 replications), random-effects GLS, two-way fixed effects with robust errors, within fixed effects, and fixed-effects models with Driscoll-Kraay standard errors—the coefficients for FDI proxies (i.e., investment, profitability, and innovation) are negative and statistically significant at the 1% or 5% levels ($p < 0.01$ or $p < 0.05$). For instance, in the Driscoll-Kraay fixed-effects model, a 1% increase in FDI-related variables is associated with a -0.08 to -0.17 reduction in the Gini coefficient, supporting *H1*. In contrast, firm efficiency shows a positive and robust relationship with inequality, suggesting that improvements in operational efficiency may exacerbate income disparities.

Green technology innovation exhibits positive coefficients across all models, significant at conventional levels, rejecting *H2*. Overall, a 1% increase in green technology innovation is associated with a 0.04% increase in income inequality of 0.04%. The results suggest that higher levels of green patenting are positively associated with income inequality. Among the control variables, income per capita and age dependency exhibit strong, statistically significant negative effects, indicating that higher average income levels and higher dependency reduce income inequality. Trade openness carries a positive but statistically insignificant coefficient across specifications, suggesting that it has no direct effect on inequality. The relatively high within R-squared values (approximately 0.23–0.29 in the fixed-effects models) suggest a satisfactory model fit. Moreover, the stability of coefficient magnitudes across alternative estimation techniques reinforces the robustness of the findings.

We extend the analysis by re-estimating all regression models using quantile regression to assess the robustness of the baseline results. Quantile regression results reported in Table 7 reveal substantial heterogeneity across the inequality distribution. Specifically, the effects are stronger at higher inequality quantiles, most notably at the 75th quantile, where the coefficient for FDI investment is −0.02, implying that the magnitude of the effect increases as inequality

rises. A 1% increase in firm investment leads to a -0.2% decrease in income inequality. Moreover, the negative effects of firm investment and profitability intensify at higher quantiles of the inequality distribution. Firm profitability exerts a comparatively stronger negative impact on income inequality at lower quantiles. This suggests that capital investment and firm innovation are more effective at reducing inequality in countries with higher income inequality, whereas firm profitability has a stronger inequality-reducing effect in countries with lower income inequality. In contrast, the magnitude of the positive coefficient of firm efficiency on income inequality declines from the 10th to the 75th quantile, suggesting that improvements in efficiency are associated with greater income inequality, particularly in countries with higher levels of inequality.

The findings indicate that green technology innovation exerts a positive effect on income inequality. However, the magnitude of the coefficients declines monotonically across the distribution, decreasing from +0.05 at the 10th percentile to +0.03 at the 90th percentile. This pattern suggests that the inequality-enhancing effect of green innovation is stronger in relatively less unequal contexts and weakens as inequality increases. Regarding the control variables, income per capita and age dependency significantly reduce inequality at lower quantiles, while trade openness exhibits a positive and statistically significant effect equally at the lower quantiles.

4.2 Moderating effects

To estimate the moderating effects, we re-estimate all specifications by including interaction terms among the variables of interest. We begin with the Driscoll–Kraay fixed-effects estimator and then proceed through the panel quantile regression approach. The results of these estimations are reported in Tables 6 and 8. Overall, the results provide evidence that green technology innovation has statistically significant effects on income inequality, conditional on FDI.

Turning to the moderating effects, Tables 6 and 8 present the interaction terms between FDI and green innovation. In Table 6 (panel regressions), across different model specifications with Driscoll–Kraay robust standard errors, the interaction between green technology innovation and FDI exhibits a negative, statistically significant inequality-reducing effect. The interaction between FDI—specifically firm investment and firm profitability—and green

technology innovation yields negative and statistically significant coefficients at conventional levels, suggesting that the inequality-reducing effect of green technology innovation strengthens as firms become more capital- or profit-intensive. The interaction term involving firm innovation is negative and statistically significant at the 5% level, suggesting that as firms increase their R&D intensity, additional green technological efforts reduce income inequality. In contrast, the interaction between firm efficiency and green technology innovation is positive but not statistically significant, indicating that efficiency gains do not meaningfully increase or decrease income inequality.

Quantile results in Table 8, with bootstrapped standard errors, yield results similar to those of the fixed effects for the interaction between firm profitability and green technology innovation, while the other interaction terms become statistically insignificant, suggesting they do not affect income inequality. The moderating influence of firm investment and firm innovation, while negative, does not attain statistical significance across quantiles. However, the moderating effect of firm profitability on green technology innovation remains consistently negative and highly significant at the 1% level across the 10th to 90th quantiles (coefficients range between -0.007 and -0.008). These findings support *H3*, highlighting the robustness of the result that the interaction between FDI and green technology innovation contributes to reducing income inequality across countries. With respect to the control variables, income per capita and age dependency are associated with lower income inequality, whereas trade openness is not. These results are consistent with the estimates of the direct effects.

4.3 Discussion

The results of this study provide support for the hypothesised relationships among FDI, green technology innovation, and income inequality in high-income OECD countries, extending the IB literature on MNE spillovers and social cohesion (Krammer et al., 2023). More specifically, the results reveal three complementary patterns. First, the baseline fixed-effects models indicate that inward FDI is generally associated with lower income inequality, although the magnitude and significance vary across operational outcomes. Second, green technology innovation is consistently associated with higher inequality, which aligns with arguments that innovation can generate uneven distributive effects via skill-based technological change and differential access to innovation rents (Acemoglu, 2002; Katz & Murphy, 1992; Krusell et al.,

2000; Zingales, 2017). Third, once interaction terms are introduced, the distributional role of green innovation becomes conditional. Green technological innovation tends to reinforce the inequality-reducing role of FDI, most robustly when FDI is captured by firm profitability. This aligns with perspectives emphasizing interdependence between MNE performance and the political economy of national competitiveness in shaping distributional outcomes (Rygh, 2021; Rygh et al., 2022).

The evidence validates *H1*, which posits that FDI reduces income inequality. This pattern is consistent with the view that FDI inflows have distributional effects in host countries aligning with Figini and Görg (1999). This aligns with the IB scholarship, which emphasises FDI's role in generating knowledge spillovers, job creation, and productivity enhancements that disproportionately benefit lower-income segments in advanced economies (Herzer & Nunnenkamp, 2013). In high-income host economies, an inequality-reducing association can be interpreted through channels linked to the diffusion of firm-specific intangible assets and spillovers. MNEs possess firm-specific assets, such as technological knowledge and management expertise, that can generate embodied knowledge spillovers and productivity-enhancing effect in recipient countries, giving them a productivity advantage over domestic firms (Borensztein et al., 1998; Buckley & Casson, 2020; Hejazi & Safarian, 1999). FDI, as a kind of capital flow, is reported to deliver substantial technological spillovers to recipient countries; externalities from inward FDI can influence income inequality (Driffield, 2006). In addition, productivity spillovers can materialise through linkages between foreign affiliates and local suppliers, helping diffuse knowledge beyond foreign affiliates and potentially broadening the distributional benefits of FDI (Javorcik, 2004). However, these results contradict the findings of Wang et al. (2023), who report that FDI inflows increase inequality in developed countries, as well as those of Asteriou et al. (2014), who argue that capitalisation through FDI constitutes the major driver of inequality in advanced economies.

Importantly, our results also indicate that the distributional implications of FDI depend on the type and nature of foreign affiliate activity captured by the firm-level indicators. The negative associations observed for capital investment and R&D intensity are consistent with evidence that inward FDI can generate productivity and innovation spillovers in host economies, thereby supporting broader capability upgrading (Branstetter & Saggi, 2011; Crescenzi et al., 2015; Grafström, 2018). This challenges earlier mixed evidence, which

suggests that FDI could sometimes exacerbate disparities in the presence of weak institutions, and where corporate and business legitimacy faced public scrutiny (Shrivastava & Ivanova, 2015). By contrast, the positive relationship between firm efficiency and inequality suggests that efficiency-driven outcomes may be more closely aligned with the distributional tensions highlighted in the skill-biased technological change literature, where technologically advanced production can raise the relative demand for skilled labour and widen wage dispersion (Berman et al., 1998; Krusell et al., 2000; Machin & Van Reenen, 1998). This heterogeneity helps explain why empirical findings on FDI and inequality remain mixed across contexts and measures (Huang et al., 2020; Ofori & Asongu, 2024).

Contrary to expectations, the findings do not confirm *H2*. Instead, they indicate that increased green technology innovation is associated with higher income inequality in the host country. This result is consistent with the study by Aghion et al. (2019), who report a positive relationship between innovation and income inequality. It also aligns with Law et al. (2020), who found that innovation can exacerbate income inequality through the moderating effect of globalisation and financial development. One plausible interpretation is that green technological innovation, measured here through environmental patenting, may generate returns that accrue disproportionately to innovators, high skilled workers, and owners of intellectual property, thereby reinforcing income concentration. This is consistent with arguments that innovation can increase market concentration and enable innovators to secure a disproportionate share of income and wealth (De Loecker et al., 2020; Zingales, 2017), as well as with evidence that technological change alters the relative wages of skilled versus unskilled workers (Krusell et al., 2000; Machin & Van Reenen, 1998). In the specific context of green transitions, the literature suggests that green technology may either challenge or reproduce social inequality depending on its accessibility and diffusion and may disproportionately favour skilled workers or wealthier regions if not accompanied by inclusive policies (Acemoglu et al., 2012; Acemoglu et al., 2014; Acemoglu & Restrepo, 2018; Geels, 2002; Piketty & Zucman, 2014). For instance, MNEs act as conduits for the innovation and diffusion of green technology, thereby promoting green growth and helping reduce inequality through collective social action (Audebrand & Barros, 2017; Khan et al., 2025). Thus, our findings align with contexts where innovation and local patent capacity widen income gaps, as observed in U.S. metropolitan areas in the early stages of their life cycle (Barbieri et al., 2025).

The empirical findings support *H3*, demonstrating that green technology innovation moderates the relationship between FDI and income inequality by strengthening FDI's inequality-reducing effect in host countries. Specifically, while FDI is associated with lower income inequality, this association is stronger in countries with higher levels of green technology innovation. This moderation highlights how green-focused FDI amplifies spillovers, enabling MNEs to redistribute gains through eco-efficient operations and inclusive value chains (Wang et al., 2021). MNEs leverage green innovations as strategic resources to enhance competitiveness while addressing societal inequities, as seen in OECD transitions to net-zero economies (Bouguerra et al., 2025; Finseraas & Nyhus, 2025).

The quantile estimates further clarify this heterogeneity. First, the inequality-increasing association of green technology innovation is strongest at the lower quantiles and weakens toward the upper quantiles, which is consistent with the idea that innovation rents and skill premia can shape distributional outcomes differently depending on a country's initial inequality level (Acemoglu, 2002; Krusell et al., 2000). Second, the increasingly negative coefficients for capital investment and foreign affiliate R&D intensity at higher quantiles suggest that investment- and innovation-intensive foreign activities may play a more pronounced inequality-reducing role in countries where inequality is already relatively high, in line with evidence that FDI can generate productivity and invention spillovers through local linkages (Branstetter & Saggi, 2011; Grafström, 2018; Javorcik, 2004). Finally, the robustness of the profitability × green innovation interaction across quantiles indicates that profitability conditions how green technological efforts translate into more inclusive outcomes, strengthening the inequality-reducing role of FDI throughout the distribution.

The impact of FDI on income inequality is influenced not only by the presence of green technological innovation but also by the type and nature of FDI, with different forms of investment yielding distinct distributional outcomes. In particular, the inequality-reducing effect is strong in highly profitable firms across countries with low or high inequality. Innovation enhances firm performance by generating productivity gains, reducing operational costs, and strengthening competitive advantage (Huang et al., 2023). More profitable firms are likely to have greater absorptive capacity, allowing them to internalise the benefits of green technological progress more effectively than less profitable counterparts (Wu et al., 2023). Profitability may therefore act as a conditioning factor because it enables complementary investments such as organisational upgrading, process redesign, and capability development

that help green technologies diffuse beyond a narrow set of rent holders. This interpretation is consistent with arguments that the distributional effects of innovation depend of how property rights and innovation rents are exploited and with evidence that spillovers from foreign affiliates can materialise through linkages with domestic firms (Zingales, 2017). In this sense, profitability supports the scaling and diffusion of green technological change, strengthening the likelihood that the combined effect of FDI and green innovation translates into more inclusive outcomes. Green innovation, defined as the production, assimilation, and exploitation of new methods, processes, and products that can reduce costs, enables firms to maintain profitability while addressing broader economic challenges (Barbieri et al., 2016; Crescenzi et al., 2015; Tang & Yang, 2024).

Ascani et al. (2020) argue that the superior knowledge held by MNEs can spill over to domestic companies, thereby enhancing their innovation capacity. FDI and innovation display a bidirectional relationship, reinforcing positive spill-over effects that enhance a country's overall innovation capacity (Crescenzi et al., 2015). Hence, factors conducive to innovation are crucial for attracting market-seeking FDI, while also helping to ensure that its economic gains are distributed in a manner that does not widen income inequality (Dunning, 1980). Governments should recognize FDI's role in enabling knowledge transfer, advancing technology diffusion, and driving innovation. By extending this logic to the environmental domain, foreign firms can also facilitate the diffusion of environmentally friendly knowledge and foster green technological spillovers in host countries (Benito & Meyer, 2024). Because green technologies appear to generate stronger and more pervasive spillovers than non-green technologies, green-oriented foreign activities may help translate innovation upgrading into broader societal benefits (Barbieri et al., 2020). However, our results also suggest that green technological innovation, in isolation, may be associated with higher inequality, implying that policy efforts should not only promote green invention but also support its diffusion and accessibility so that green innovation contributes to inclusive outcomes (Hardi et al., 2025).

5. Conclusion

This study demonstrates that FDI, proxied by the performance of majority-owned U.S. foreign affiliates, and green technology innovation significantly reduce income inequality in high-

income OECD countries. Notably, green innovation moderates this relationship, yielding stronger inequality-mitigating effects. By analysing a panel dataset from 2000 to 2020 using fixed-effects regressions and quantile models, the findings reveal that FDI spillovers—through investment, profitability, and efficiency—contribute to equitable outcomes, while green patents in renewable and low-carbon technologies amplify these benefits by reducing income inequality. These contributions are significant for IB scholarship, as they provide empirical evidence on the role of MNEs in addressing grand societal challenges, such as inequality, and extend resource-based and institutional theories to highlight the interdependent dynamics between firms and their hosts.

Taken together, the findings provide clear answers to the research questions. Regarding *RQ1*, green technology innovation is associated with higher income inequality, suggesting that environmental patenting may generate uneven distributive outcomes. Regarding *RQ2*, inward FDI—proxied by the performance and operational outcomes of U.S. majority-owned foreign affiliates—is, on average, associated with lower income inequality, although the magnitude and significance vary across the different dimensions of foreign affiliate activity. Regarding *RQ3*, green technology innovation moderates the relationship between FDI and income inequality by strengthening FDI's inequality-reducing association in the host country. Specifically, when green innovation is extensive, FDI is more effective in reducing income inequality. Firm profitability further shapes this relationship, with more profitable firms better able to leverage innovation and investment for broader economic benefits. Overall, the findings underscore the importance of fostering green technological innovation and attracting FDI and MNEs as complementary mechanisms to mitigate income disparities, offering novel insights into how FDI and innovation interact to influence economic inequality.

5.1 Research implications

Theoretical implications

First, the study extends the FDI–inequality debate by showing that distributional outcomes are not driven by FDI alone, but by how FDI interacts with host-country innovation trajectories and the nature of foreign affiliate activity. Conceptually, this moves the debate from the presence of FDI to the quality and configuration of foreign affiliate activity (e.g., investment-, innovation-, profitability-, or efficiency-oriented outcomes) as the mechanism through which distributional consequences emerge. This supports the broader view that MNE performance

and national competitiveness dynamics are intertwined in shaping within-country outcomes (Rygh, 2021; Rygh et al., 2022). By operationalizing FDI through the performance and operational outcomes of U.S. majority-owned foreign affiliates, the study also provides a firm-outcome lens on FDI that helps link MNE behaviour more directly to distributional outcomes in host economies. Second, the results refine innovation–inequality reasoning by highlighting a conditional pattern: green technological innovation is associated with higher inequality in isolation, yet it strengthens the inequality-reducing association of FDI when combined with certain types of foreign affiliate activity—most robustly when FDI is captured by profitability. This underscores the need for future theory-building to distinguish between the distributive consequences of innovation rents and the distributive consequences of innovation diffusion (Acemoglu, 2002).

Social implications

The important societal tension that our findings highlight is the one related to how economies may advance in green technological innovation while simultaneously experiencing widening income disparities. This suggests that the benefits of environmental innovation may not be evenly shared across social groups, especially if returns accrue disproportionately to innovators, high-skilled workers, and owners of intellectual property, while lower-skilled workers and vulnerable groups face slower wage growth or displacement pressures (Acemoglu, 2002). The quantile results further imply that these distributive risks can vary with a country's initial inequality level, reinforcing the need to evaluate green transitions not only by innovation outputs but also by who gains from them across the income distribution.

At the same time, the moderation findings point to a more optimistic societal pathway: when green technological innovation co-evolves with foreign affiliate activity—particularly when foreign firms are profitable and able to support diffusion-oriented investments—FDI can contribute more strongly to inequality reduction. From a social perspective, this indicates that inclusive outcomes are more likely when green innovation is accompanied by capability-building mechanisms that broaden access to skills, technologies, and opportunities, rather than remaining concentrated within a narrow segment of the economy (Geels, 2002). Overall, the results underscore that the social success of the green transition depends on more than just generating green inventions. It depends on ensuring diffusion, accessibility, and participation so that environmental progress does not come at the cost of social cohesion.

Managerial implications

For multinational enterprises and foreign affiliates, the results imply that the distributional footprint of international operations depends on the type of activity pursued in host countries. Investment- and innovation-oriented foreign affiliate activity is more likely to align with inequality-reducing outcomes, whereas efficiency-driven outcomes may be associated with widening income gaps. Managers should therefore treat "how we compete" in the host country—through capital deepening, innovation investment, or cost-driven efficiency—as not only a performance choice but also a distributional one that can shape social outcomes and legitimacy.

The robust role of profitability in the moderation results further suggests that financially stronger affiliates are better positioned to translate green technological efforts into broader societal benefits. Practically, this means that managers seeking to scale green innovation should complement it with diffusion-oriented strategies that widen access to the gains from technological upgrading. Examples include supplier development initiatives that transfer know-how to domestic firms, workforce development and upskilling programs that reduce skill bottlenecks, and local partnerships that support the adoption of green processes beyond the foreign affiliate itself (Ascani et al., 2020; Javorcik, 2004). Such practices can help ensure that green innovation does not remain a narrow source of rents but becomes part of a broader capability-building trajectory in host economies (Rygh, 2021).

Policy implications

Policy efforts to attract FDI should prioritise the quality of foreign affiliate activity, particularly the forms of investment and innovation that are most likely to generate broad-based spillovers and inclusive outcomes. Policies that encourage investment- and innovation-oriented activities and that strengthen the diffusion of knowledge beyond foreign affiliates are therefore more likely to support inequality reduction. Moreover, given the positive association between green technological innovation and income inequality observed in this study, promoting green invention alone may be insufficient; host-country strategies should emphasise diffusion and accessibility so that the benefits of green technological progress do not remain concentrated among a narrow set of innovators and high-skilled groups (Acemoglu, 2002; Geels, 2002).

At the domestic level, efforts to attract FDI should therefore be complemented by policies that facilitate knowledge spillovers from MNEs subsidiaries to domestic firms and

workers. Such measures may include workforce training and upskilling programs, support for absorptive capacity in local firms, and incentives that strengthen linkages between foreign affiliates and domestic suppliers (Javorcik, 2004). These measures can help convert the FDI– green innovation complementarity identified in this study into broader-based gains, particularly when foreign affiliates have the profitability and capacity to scale green technological efforts.

At the international level, green technology transfer should occupy a more prominent position within global investment and trade-related frameworks such as the World Trade Organization (WTO) and the Agreement on Trade-Related Investment Measures (TRIMS), reflecting the public- goods nature of green technologies and supporting their global diffusion through FDI. Finally, international organisations, particularly the United Nations Framework Convention on Climate Change (UNFCCC), should place greater emphasis on FDI as a channel for green technology transfer, supporting sustainable development while reducing the risk that the green transition exacerbates inequality.

5.2 Limitations and future research

This study focuses on high-income OECD host countries. While this provides a consistent institutional and data environment for analysing within-country inequality and cross-national innovation patterns, it also limits variation in development levels and institutional contexts. Future research could extend this analysis to middle-income and emerging economies, where labour-market structures, redistribution capacity, and innovation systems differ substantially and may reshape both the direct effects of green technology innovation and the moderating role identified in this study.

A second limitation concerns the measurement of FDI through the performance and operational outcomes of U.S. majority-owned foreign affiliates. Although this approach offers a firm-outcome lens on FDI and allows us to distinguish between different dimensions of foreign affiliate activity, it may limit generalisability to other source countries and investment profiles. Future work could examine whether similar patterns hold for FDI originating from other major sources and whether home-country characteristics or MNE strategies shape how foreign affiliate activity interacts with green technology innovation to influence inequality.

Third, the use of patent-based indicators captures inventive activity and national specialisation in environment-related technologies, but it might not fully reflect diffusion,

adoption, or the inclusiveness of technological change. Future research could incorporate complementary measures of green technology deployment and diffusion such as adoption indicators, green job creation, and workforce upskilling to better understand when green technological progress contributes to inclusive outcomes versus when it is associated with rising inequality.

Beyond these scores and measurement extensions, future research should also deepen understanding of the mechanisms through which FDI and green technology innovation jointly shape distributional outcomes. In particular, richer data could be used to examine how foreign affiliate activity affects wage structures, skill upgrading, and the distribution of opportunities across workers, regions, and sectors. Such work would help clarify when green innovation functions primarily as a source of concentrated rents and skill premia versus when it diffuses more broadly through supplier linkages, workforce development, and domestic capability building.

5.3 Concluding remarks

In addressing the identified gap in the IB literature—where the interaction between FDI and green innovation in shaping inequality has received limited attention, particularly in advanced economies—this research illuminates how MNE-driven technologies can redistribute economic gains amid rising disparities. Prior studies have focused on the direct effects of FDI in emerging markets, often overlooking moderation mechanisms in OECD contexts with strong institutions. By filling this void, the study advances understanding of national competitiveness, showing that green innovation not only counters skill-biased change but also enhances FDI's spillovers for broader societal equity.

Ultimately, this work underscores the broader relevance of integrating sustainability into IB strategies, highlighting how MNEs can serve as engines for inclusive and environmentally responsible globalisation in an era of escalating climate and social challenges. This study contributes to IB research by highlighting that inequality is a central outcome of cross-border investment and that its trajectory depends on the interaction between MNE strategies and host-country competitiveness dynamics, as well as national innovation systems. The broader implication is that the green transition cannot be evaluated solely through technological progress or environmental performance. It must also be assessed through its

distributional consequences. Aligning foreign affiliate activity with diffusion and capability building can help ensure that sustainability-oriented innovation supports social cohesion and shared prosperity.

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Table 1.
Typology for the green technology innovation-income inequality nexus

Type	Description	Mechanism	Example	Reference
Innovation-driven inequality	Innovations create economic opportunities that disproportionately benefit skilled or wealthy groups, widening income gaps	Skill-biased technological change; unequal access to training or capital for green technologies	Growth of high-skill green jobs	Vona et al. (2018) argue that the demand for green skills can increase wage disparities without inclusive training
Inequality as a barrier to innovation	High-income inequality limits the adoption or development of green innovations in disadvantaged communities	Limited resources for R&D; unequal access to education restricts innovation capacity	Rural poor are unable to adopt costly smart grid technologies in developing nations	Boyce (1994) suggests that inequality hinders equitable environmental solutions by concentrating benefits
Environmental equity feedback	Innovations reduce environmental harm, benefiting low-income groups that are disproportionately affected by degradation, and potentially narrowing inequality	Targeted policies or technologies (e.g., pollution control) improve living standards for the poor	Air quality improvements in urban slums via green tech reduce health costs for low-income families	Geels (2011) notes that sustainability transitions can disrupt inequality if designed inclusively
Global disparity amplifier	Innovations in wealthy regions impose costs on poorer nations, exacerbating global income inequality	Trade policies (e.g., carbon tariffs) shift economic burdens to less industrialised countries	European Union Carbon Border Adjustment Mechanism increases export costs for (example) India, affecting low-income workers in manufacturing	Acemoglu et al. (2012) highlight how directed technical change can widen gaps between adopters and non-adopters

Source: Authors own elaboration.

Table 2.
Definition of variables and data sources

Variable	Short definition	Long definition	Source	Reference
Income inequality	Gini coefficient	Gini index of disposable income "post-tax" and equivalized by dividing each household observation by the square root of the number of household members	Luxembourg Income Study (LIS)	Atkinson (20024), Wang et al. (2014)
Firm investment	Capital investment	Ratio of total capital expenditures to the net value of its property, plant, and equipment in millions of US dollars	Bureau of Economic Analysis (BEA)	Slaughter (2000)
Firm profitability	Return on assets	Ratio of net income to total assets in millions of US dollars	Bureau of Economic Analysis (BEA)	Gomes & Ramaswamy (1999)
Firm efficiency	Return on sales	Ratio of operating profits (value added) to sales in millions of US dollars	Bureau of Economic Analysis (BEA)	Daniels & Bracker (1989)
Firm innovation	R&D intensity per employee	Ratio of R&D expenditures to a firm's total number of employees in millions of US dollars	Bureau of Economic Analysis (BEA)	Hitt et al. (1997), Kim et. al. (2010)
Green technology innovation	Green patents	Number of patents of environment-related inventions expressed as a percentage of all domestic inventions in all technologies	OECD Green Growth Indicators	Betarelli et al. (2024)
Controls	Income per capita	Gross domestic product per inhabitant in constant 2017 US dollars)	World Development Indicators (WDI)	Asteriou et al. (2003)
	Trade openness	Sum of exports and imports to GDP ratio in percentage	World Development Indicators (WDI)	Kammas & Sarantides (2019)
	Age dependency	Percentage of individuals aged below 15 or above 64 relative to the working-age population	World Development Indicators (WDI)	Kammas & Sarantides (2019)

Source: Authors own elaboration.

Table 3.
Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Income inequality	364	-1.205	0.133	-1.519	-0.642
Green technology innovation	350	2.366	0.367	0.718	3.355
Firm investment	361	1.396	0.749	-0.872	3.614
Firm profitability	360	-3.226	0.712	-7.573	-1.315
Firm efficiency	359	-1.382	0.389	-3.364	-0.302
Firm innovation	301	1.535	1.161	-2.279	3.790
Income per capita	364	10.627	0.357	9.568	11.652
Trade openness	364	4.535	0.503	3.350	5.946
Age dependency	364	3.915	0.114	3.597	4.201

Note: Data is log-transformed. Source: Authors own elaboration.

Table 4.

Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Income inequality	1.000								
(2) Green technology innovation	0.014	1.000							
(3) Firm investment	0.250***	-0.094*	1.000						
(4) Firm profitability	-0.106**	-0.160***	-0.073	1.000					
(5) Firm efficiency	0.285***	-0.085	0.281***	0.021	1.000				
(6) Firm innovation	-0.168***	-0.244***	-0.059	0.009	-0.136**	1.000			
(7) Income per capita	-0.439***	-0.054	-0.251***	0.173***	-0.496***	0.612***	1.000		
(8) Trade openness	-0.390***	0.022	-0.395***	0.397***	-0.400***	0.114**	0.446***	1.000	
(9) Age dependency	0.079	-0.154***	-0.061	-0.159***	0.233***	0.529***	0.131**	-0.247***	1.000

Source: Authors own elaboration.

Table 5.
Panel regression results: Direct effects

	Model 1	Model 2	Model 4	Model 5	Model 6	Model 7
	OLS	Median	GLS	Two-way FE	Within FE	Driscoll-Kraay FE
Green technology innovation	0.036	0.033	0.036***	0.036**	0.036**	0.036***
	(0.022)	(0.024)	(0.014)	(0.016)	(0.014)	(0.012)
Firm investment	-0.017	-0.012	-0.017**	-0.017**	-0.017**	-0.017**
	(0.010)	(0.011)	(0.008)	(0.008)	(0.008)	(0.006)
Firm profitability	-0.008	-0.004	-0.008	-0.008*	-0.008	-0.008*
	(0.007)	(0.008)	(0.005)	(0.005)	(0.005)	(0.004)
Firm efficiency	0.035*	0.043*	0.035**	0.035**	0.035**	0.035***
	(0.019)	(0.024)	(0.016)	(0.014)	(0.016)	(0.010)
Firm innovation	-0.014	-0.017	-0.014*	-0.014	-0.014*	-0.014*
	(0.017)	(0.012)	(0.008)	(0.010)	(0.008)	(0.007)
Income per capita	-0.134**	-0.115*	-0.134***	-0.134***	-0.134***	-0.134***
	(0.059)	(0.059)	(0.041)	(0.039)	(0.041)	(0.014)
Trade openness	0.035	0.083	0.035	0.035	0.035	0.035
	(0.075)	(0.053)	(0.033)	(0.037)	(0.033)	(0.026)
Age dependency	-0.342**	-0.355**	-0.342***	-0.342***	-0.342***	-0.342***
	(0.126)	(0.142)	(0.088)	(0.080)	(0.088)	(0.070)
Constant	1.489*	1.202	1.489***	1.489***	1.355**	1.374***
	(0.753)	(0.781)	(0.573)	(0.510)	(0.566)	(0.256)
Observations	280	294	280	280	280	280
R2	0.936	0.754	0.936	0.936	0.288	0.228

Note: OLS=Pooled OLS with clustered standard errors. Median=Pseudo R2 for the median quantile regression with bootstrapped standard errors (200 replications). GLS=Random effects Generalised least squares regression. Two-way FE=Two-way fixed effects with robust standard errors. Within FE=Within R2 for the fixed effects within regression. Driscoll-Kraay FE=Within R2 for the fixed-effects regression with Driscoll-Kraay standard errors. All models include year fixed effects and country fixed effects. *** p<0.01, ** p<0.05, * p<0.1. Source: Authors own elaboration.

Table 6.
Panel regression results: Moderating effects

	Model 1	Model 2	Model 3	Model 4
Firm investment x Green technology innovation	-0.008***			
	(0.002)			
Firm profitability x Green technology innovation		-0.002*		
		(0.001)		
Firm efficiency x Green technology innovation			0.003	
			(0.002)	
Firm innovation x Green technology innovation				-0.003**
				(0.001)
Income per capita	-0.192***	-0.162***	-0.205***	-0.124***
	(0.046)	(0.051)	(0.043)	(0.036)
Trade openness	0.048	0.036	0.044	-0.007
	(0.029)	(0.033)	(0.031)	(0.025)
Age dependency	-0.202*	-0.149	-0.154	-0.265**
	(0.103)	(0.102)	(0.100)	(0.103)
Constant	1.404**	0.894***	1.357**	0.001***
	(0.615)	(0.593)	(0.564)	(0.000)
Observations	347	346	345	287
Within R2	0.165	0.121	0.145	0.120

Note: Fixed-effects regression with Driscoll-Kraay standard errors in parenthesis. All models include year fixed effects and country fixed effects. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Source: Authors own elaboration.

Table 7.
Panel quantile regression results: Direct effects

	Model 1	Model 2	Model 3	Model 4	Model 5
			Quantile		
	10th	25th	50th	75th	90th
Green technology innovation	0.052***	0.044***	0.037***	0.029**	0.023
	(0.018)	(0.015)	(0.013)	(0.014)	(0.016)
Firm investment	-0.007	-0.012	-0.016**	-0.020***	-0.023***
	(0.011)	(0.009)	(0.007)	(0.008)	(0.009)
Firm profitability	-0.016**	-0.014***	-0.013***	-0.012**	-0.011
	(0.007)	(0.005)	(0.005)	(0.006)	(0.007)
Firm efficiency	0.021	0.026	0.031**	0.036**	0.039*
	(0.020)	(0.016)	(0.015)	(0.017)	(0.020)
Firm innovation	-0.014	-0.015*	-0.017**	-0.018**	-0.019*
	(0.011)	(0.009)	(0.008)	(0.009)	(0.010)
Income per capita	-0.087*	-0.074*	-0.062	-0.049	-0.039
	(0.051)	(0.042)	(0.038)	(0.043)	(0.050)
Trade openness	0.086**	0.062*	0.040	0.015	-0.002
	(0.042)	(0.037)	(0.036)	(0.040)	(0.046)
Age dependency	-0.146*	-0.121*	-0.099	-0.075	-0.057
	(0.078)	(0.066)	(0.064)	(0.075)	(0.088)
Observations	280	280	280	280	280

Note: Bootstrapped standard errors in parentheses. All regressions include country fixed effects. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Source: Authors.

Table 8.
Panel quantile regression results: Moderating effects

	Model 1	Model 2	Model 3	Model 4	Model 5
			Quantile		
	10th	25th	50th	75th	90th
Firm investment x Green technology innovation	-0.003	-0.004	-0.004	-0.005	-0.005
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Firm profitability x Green technology innovation	-0.008***	-0.008***	-0.007***	-0.007***	-0.007**
	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)
Firm profitability x Green technology innovation	-0.001	0.003	0.006	0.009	0.011
	(0.008)	(0.006)	(0.006)	(0.007)	(0.008)
Firm innovation x Green technology innovation	-0.001	-0.001	-0.002	-0.003	-0.004
	(0.005)	(0.004)	(0.003)	(0.004)	(0.004)
Income per capita	-0.123**	-0.106**	-0.088**	-0.069	-0.056
	(0.048)	(0.041)	(0.041)	(0.048)	(0.056)
Trade openness	0.094**	0.060	0.024	-0.013	-0.037
	(0.044)	(0.038)	(0.037)	(0.043)	(0.049)
Age dependency	-0.147*	-0.108	-0.068	-0.025	0.003
	(0.088)	(0.076)	(0.073)	(0.087)	(0.101)
Observations	280	280	280	280	280

Note: Bootstrapped standard errors in parentheses. All regressions include country fixed effects. $^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.
Source: Authors own elaboration.