



Complexidade econômica e desigualdade de renda em economias de industrialização tardia (1990–2019)

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Resumo: Este artigo analisa se a relação entre complexidade econômica e desigualdade de renda é homogênea entre economias de industrialização tardia. À luz do arcabouço do Rise of the Rest de Amsden, o estudo investiga como diferentes trajetórias de desenvolvimento condicionam os efeitos distributivos do upgrading produtivo em países de renda média, com destaque para economias relevantes ao grupo dos BRICS. Utiliza-se um painel não balanceado de 132 países entre 1990 e 2019, no qual a complexidade econômica é mensurada por um Índice de Complexidade Econômica (ECI) normalizado e a desigualdade pelo coeficiente de Gini. A estratégia empírica combina estimações por MQO agrupado e modelos de painel com efeitos fixos, incorporando termos de interação e efeitos marginais. Os resultados indicam que, no agregado, a complexidade associa-se ao aumento da desigualdade. Contudo, em linha com Amsden, emergem padrões contrastantes: a complexidade reduz a desigualdade no Leste Asiático e a eleva na América Latina. Conclui-se que os efeitos distributivos da complexidade dependem dos regimes de desenvolvimento.

Palavras-chave: complexidade econômica; upgrading industrial; desigualdade; industrialização tardia; regimes de desenvolvimento.

Economic complexity and income inequality in late industrializing economies (1990–2019)

Abstract: This paper examines whether the relationship between economic complexity and income inequality is homogeneous across late industrializing economies. Drawing on Amsden's Rise of the Rest framework, it investigates how distinct development trajectories shape the distributive consequences of productive upgrading in middle-income countries, with particular relevance for the BRICS group. The analysis relies on an unbalanced panel of 132 countries from 1990 to 2019, measuring economic complexity through a normalized Economic Complexity Index (ECI) and inequality through the Gini coefficient. The empirical strategy combines pooled OLS and fixed-effects panel estimations, incorporating interaction terms and marginal effects to capture heterogeneity. At the global level, economic complexity is positively associated with income inequality. However, consistent with Amsden's typology, this average effect conceals opposing patterns: complexity is inequality-reducing in East Asian late industrializers and inequality-increasing in Latin American ones. The findings indicate that the distributive effects of economic complexity are not universal but contingent on development regimes and institutional configurations.

Keywords: economic complexity; industrial upgrading; inequality; late industrialization; development regimes

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1. Introduction

Understanding how structural transformation shapes income distribution has re-emerged as a central concern in development economics. Over the past three decades, many middle-income economies have experienced significant productive upgrading, deeper insertion into global value chains and increasing export diversification. Yet, despite similar aspirations toward industrialization and technological advancement, their distributional outcomes have diverged sharply. Several East Asian economies reduced inequality during periods of rapid export upgrading, while major Latin American economies faced persistent or rising inequality alongside episodes of technological modernization. This divergence raises a fundamental question: under what conditions does productive upgrading translate into inclusive, rather than unequal, development?

This question is particularly salient in the context of the economic complexity approach, which argues that development depends not only on factor accumulation, but also on the composition and sophistication of productive structures (Hidalgo & Hausmann, 2009; Hausmann et al., 2011). Countries that accumulate capabilities embedded in complex goods tend to experience faster growth and higher income levels. However, whether productive sophistication also fosters more equal societies remains theoretically and empirically ambiguous. While early contributions suggest that higher complexity is associated with lower income inequality (Hartmann et al., 2017), more recent studies report positive or non-linear relationships once institutional, demographic and macroeconomic controls are included (Chu & Hoang, 2020; Lee & Vu, 2020). Evidence from within-country and regional analyses further complicates the picture, indicating that complexity may increase wage dispersion in contexts characterized by enclave upgrading or segmented labor markets (Morais et al., 2021). The absence of a clear consensus suggests that the distributive consequences of productive upgrading are not universal, but contingent.

The stakes of this debate are particularly high for middle-income economies, many of which are members or strategic partners of the BRICS grouping. These countries face the dual challenge of escaping the so-called middle-income trap while addressing historically high levels of inequality. For China and India, the central issue concerns sustaining inclusive upgrading amid demographic transitions and rapid technological change. For Brazil and South Africa, the challenge lies in reconciling pockets of export sophistication with deeply polarized labor markets. Understanding how different upgrading trajectories mediate the relationship between complexity and inequality is therefore central to designing coherent development strategies in the Global South.

A useful theoretical lens for interpreting heterogeneous outcomes is provided by Alice Amsden's analysis of late industrialization. In *Asia's Next Giant* (1989) and *The Rise of "The Rest"* (2001), Amsden argued that late industrializers followed distinct routes to capability formation, shaped by state-business relations, technological learning regimes and the role of foreign capital. East Asian economies pursued relatively independent strategies, fostering domestic technological learning, national firms and coordinated industrial policy. In contrast, Latin American economies tended toward more integrative strategies, relying heavily on foreign direct investment, multinational firms and imported technologies. These divergent paths produced distinct institutional architectures, patterns of capability diffusion and labor market outcomes. Interpreted through the lens of economic complexity, this framework suggests that similar levels of export sophistication may yield different distributional effects depending on how productive capabilities are

accumulated, governed and embedded domestically.

Despite these theoretical insights, systematic cross-country evidence linking economic complexity, inequality and historical development paths remains limited. Most empirical studies estimate average global effects or focus on specific national or subnational cases. As a result, three gaps persist. First, we lack comparative evidence on whether the complexity–inequality relationship varies systematically across late industrialization regimes. Second, it remains unclear whether global estimates conceal heterogeneity that is central for policy design in middle-income economies. Third, the complexity literature has only partially engaged with institutional and political economy accounts of development, such as those advanced by Amsden, Rodrik and Evans.

This paper addresses these gaps by examining the relationship between economic complexity and income inequality across 132 countries between 1990 and 2019, with particular emphasis on late industrializing economies. The analysis asks whether the effect of productive sophistication on inequality differs between Latin American and East Asian late industrializers, and whether these differences can be interpreted in light of distinct historical development trajectories. Empirically, the paper combines pooled regressions and fixed-effects panel models with interaction structures and marginal effects analysis, allowing for a systematic assessment of heterogeneity while controlling for observable and unobservable country characteristics.

The paper makes four main contributions. First, it provides one of the most comprehensive cross-country assessments of the complexity–inequality relationship to date, combining global estimations with explicit regional disaggregation. Second, it integrates Amsden’s “Rise of the Rest” framework into the complexity–inequality debate, offering a theoretically grounded explanation for heterogeneous effects. Third, it shows that the global association between complexity and inequality masks opposite regional patterns: inequality-reducing effects in East Asia and inequality-increasing effects in Latin America. Fourth, it situates these findings within the policy challenges faced by middle-income economies and BRICS members, highlighting the conditions under which productive upgrading can support inclusive development.

The remainder of the article is organized as follows. Section 2 reviews the relevant literature on economic complexity, inequality and late industrialization. Section 3 describes the data, variables and empirical strategy. Section 4 presents the main results and the heterogeneity analysis. Section 5 discusses the mechanisms underlying the observed patterns and their implications for development theory and policy. Section 6 concludes with policy implications, limitations and directions for future research.

2. Literature review

2.1. Economic complexity and development

The resurgence of interest in productive structures stems from longstanding concerns in development economics about why some countries manage to sustain high growth while others remain locked into low productivity paths. Traditional growth models tend to treat output as a function of capital and labor, while ignoring the heterogeneity of productive capabilities across

countries. The economic complexity literature addresses this gap by arguing that development depends not only on factor accumulation, but also on the composition and sophistication of what economies produce (Hausmann et al., 2007; Hidalgo and Hausmann, 2009).

The core contribution of this approach lies in conceptualizing knowledge as capabilities that are embedded in products, firms, regions and networks. These capabilities are often tacit, require coordination across different types of skills, and accumulate slowly through learning-by-doing, institutional support and industrial policy. According to Hidalgo and Hausmann (2009), countries differ in the sets of capabilities that they possess and recombine, and it is this combinatorial property that explains why some nations export complex products while others specialize in simple goods.

Two empirical constructs support this interpretation: diversity and ubiquity. Diversity measures how many different products a country can competitively export, while ubiquity measures how many countries can export a given product. Complex products tend to be exported by few countries, while simple goods are widespread. Based on these principles, Hausmann et al. (2011) developed the Economic Complexity Index (ECI) to quantify how diversified and non ubiquitous an export basket is. A related construct, the Product Complexity Index (PCI), measures the complexity of individual goods.

A large body of empirical work finds that higher economic complexity is strongly associated with higher levels of income and subsequent growth (Hausmann et al., 2007; Hidalgo and Hausmann, 2009; Felipe et al., 2012). These findings align with earlier structuralist and evolutionary arguments that emphasized industrialization, technological learning and sectoral change as fundamental drivers of development (Hirschman, 1958; Furtado, 1961; Reinert, 2007). In this sense, the complexity approach provides a novel empirical framework for analyzing classical claims that “what countries produce matters” for development trajectories.

The product space, a network representation of relatedness between goods, further reinforces this logic. It shows that countries located in peripheral areas of the product space face greater difficulty in upgrading into more sophisticated activities, limiting their growth opportunities (Hidalgo et al., 2007). Conversely, centrally positioned countries can diversify more easily into complex products because they already possess many of the required capabilities.

Recent extensions of this literature explore links between complexity and other dimensions of development, such as innovation, labor productivity, structural transformation and resilience to external shocks (Balland et al., 2020; Boschma et al., 2013; Hausmann et al., 2006). This broadening of scope indicates that economic complexity is increasingly seen not only as a measure of export sophistication, but as an institutional and technological framework shaping long-run development.

2.2. Economic complexity and income inequality

Beyond growth, researchers have recently begun examining whether economic complexity also affects income inequality, a question with deep implications for developing countries. The theoretical intuition is that productive structures shape the types of jobs available, skill requirements, bargaining power of workers and the distribution of rents across sectors (Hartmann et al., 2017).

Early cross-country evidence suggested that complexity is associated with lower inequality. Hartmann et al. (2017) found that countries exporting more complex products tend to show more equal income distributions, even after controlling for standard covariates. The mechanism proposed connects capability accumulation with the expansion of medium-skill and high-skill occupations, fostering social mobility and the emergence of a broader middle class. This view resonates with historical experiences in East Asia, where export upgrading was accompanied by large-scale investments in education and skill formation (Amsden, 1989; Rodrik, 1995).

However, subsequent studies have uncovered results that challenge this negative association. Chu and Hoang (2020), using a sample of 88 countries from 1990 to 2014, reported that increases in complexity are associated with higher inequality when controlling for education, government expenditure and trade openness. Lee and Vu (2020), using a System GMM estimator, reached similar conclusions for developing economies, arguing that benefits from complexity may accrue disproportionately to capital owners or high-skilled workers under certain institutional settings.

Evidence from subnational contexts further complicates the picture. Morais, Swart and Jordaan (2021) analyzed Brazilian states and found that more complex states exhibit higher income inequality, reversing the pattern found in cross-country samples. Their interpretation emphasizes that complexity does not imply diversification at the regional level, and that productive upgrading may generate enclaves of high-value activities without broad-based spillovers.

Taken together, the literature reveals significant tension and ambiguity. Differences in time periods, inequality measures (e.g. Gini, top incomes, wage dispersion), levels of analysis (national vs regional), stages of development, and institutional frameworks likely influence results. Moreover, complexity may interact with social policy, labor market regulations and educational systems, producing heterogeneous effects across contexts. This lack of consensus provides the empirical motivation for the present study and suggests that relationships between complexity and inequality are not universal, but conditioned by historical development paths.

2.3. Conceptual background: Amsden and the “Rise of the Rest”

To interpret heterogeneity across developing countries, it is useful to connect the complexity literature with the institutional and historical accounts of late industrialization developed by Alice Amsden. In her seminal work *Asia’s Next Giant* (1989) and later in *The Rise of the Rest* (2001), Amsden argued that a group of late industrializers in East Asia and Latin America underwent rapid industrial transformation during the second half of the twentieth century. Although initially similar in their late arrival to industrialization, these economies later diverged markedly in their development strategies.

Amsden (2001) identified two broad patterns. East Asian economies such as South Korea, Taiwan and later China pursued independent development paths, fostering domestic technological learning, national champions and strong state guidance in capability formation. Latin American economies such as Brazil, Argentina and Mexico pursued more integrative paths, relying more heavily on foreign direct investment, multinational firms and imported technologies, which limited domestic learning and knowledge accumulation. These divergent strategies interacted with labor market institutions and welfare regimes, shaping distributional outcomes.

This framework remains relevant for current debates on BRICS and South–South development

cooperation. It provides a lens through which to interpret why similar levels of export sophistication or complexity may produce different social outcomes depending on how capabilities were built, who controls key productive assets and how state–market relations are structured. In the context of this paper, Amsden’s contribution offers a theoretical foundation for exploring whether and why complexity may reduce inequality in some late industrializers (notably East Asia) while increasing it in others (notably Latin America).

3. Methods

3.1. Data and variables

The empirical analysis is based on an unbalanced panel of 132 countries observed between 1990 and 2019, depending on data availability. This period reflects both the availability of harmonized cross-country inequality measures and the time span over which indicators of economic complexity are systematically constructed. The panel structure allows exploiting both cross-sectional and temporal variation in inequality and productive structure, while accounting for heterogeneity across countries.

The dependent variable is income inequality, measured by the Gini coefficient on a scale from 0 to 100. Inequality data are drawn from the World Income Inequality Database (WIID) and its associated WIDER WIID Companion, which provide harmonized and comparable inequality measures across countries and over time (UNU-WIDER, 2023). The WIID is widely used in the empirical literature due to its careful standardization of income concepts, survey sources and methodological choices, which improves comparability across national contexts.

The main explanatory variable is economic complexity, measured by the Economic Complexity Index (ECI). Export data are obtained from the Atlas of Economic Complexity, which computes Revealed Comparative Advantages (RCA) at the country–product level and constructs the ECI based on the joint distribution of export diversity and product ubiquity. Following Hidalgo and Hausmann (2009) and Hausmann et al. (2014), economic complexity is understood as an emergent property of the structure of global production networks, reflecting the set of productive capabilities embedded in an economy rather than factor endowments alone. For ease of interpretation, the ECI used in this study is normalized to range between 0 and 100, with higher values indicating more sophisticated productive structures.

To mitigate omitted variable bias and align the specification with the contemporary literature on inequality, a parsimonious set of control variables is included. Economic development is proxied by GDP per capita (constant 2015 US dollars) and its squared term, both expressed in logarithms, allowing for non-linearities consistent with Kuznets-type dynamics. Human capital is captured by average years of schooling, obtained from UNESCO. Demographic scale effects are controlled for by the logarithm of total population. Institutional quality is measured by a composite index constructed as the simple average of the six Worldwide Governance Indicators (voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption). All control variables are obtained from the World Development Indicators and related World Bank governance datasets, ensuring consistent coverage across countries and time.

Table 1. Descriptive statistics by development group

	Obs.	Mean	SD	Min	Max
<i>Other countries</i>					
Gini index	3630	43.35	11.24	15.16	77.08
ECI (original scale)	3552	-0.03	1.02	-2.92	2.86
GDP per capita (log)	3488	8.27	1.52	5.24	11.38
Years of schooling	707	9.60	3.02	0.98	14.13
Population (log)	3660	16.43	1.10	14.46	19.61
Institutional quality	2509	-0.16	1.02	-2.42	2.17
<i>Latin America</i>					
Gini index	120	49.84	4.84	38.64	57.85
ECI (original scale)	120	0.37	0.53	-0.33	1.39
GDP per capita (log)	120	9.13	0.24	8.59	9.56
Years of schooling	52	8.68	1.54	5.95	11.10
Population (log)	120	17.88	0.94	16.41	19.17
Institutional quality	84	0.19	0.62	-0.57	1.60
<i>East Asia</i>					
Gini index	180	41.51	5.81	31.48	51.42
ECI (original scale)	180	0.64	0.60	-0.53	2.17
GDP per capita (log)	180	8.30	1.03	6.27	10.36
Years of schooling	36	8.17	1.99	3.22	12.12
Population (log)	180	18.96	1.53	16.68	21.07
Institutional quality	126	-0.06	0.52	-1.09	1.05
<i>Total</i>					
Gini index	3930	43.47	10.97	15.16	77.08
ECI (original scale)	3852	0.01	1.00	-2.92	2.86
GDP per capita (log)	3788	8.30	1.48	5.24	11.38
Years of schooling	795	9.48	2.92	0.98	14.13
Population (log)	3960	16.59	1.25	14.46	21.07
Institutional quality	2719	-0.14	1.00	-2.42	2.17

Source: Authors' elaboration based on WIID (UNU-WIDER), Atlas of Economic Complexity, and World Development Indicators (World Bank).

In order to capture heterogeneity across development regimes, the analysis introduces an interaction structure inspired by Amsden's (2001) concept of the "Rise of the Rest". Countries are classified into three mutually exclusive groups. The reference group consists of all countries not identified as late industrializers. Two additional groups correspond to late industrializers in Latin America and late industrializers in East Asia. This classification allows the marginal effect of economic complexity on inequality to differ systematically across regions that followed distinct historical, institutional and industrialization trajectories. The underlying motivation is that similar levels of export sophistication may reflect fundamentally different modes of capability accumulation, state-market relations and labor market institutions, leading to heterogeneous distributional outcomes.

Table 1 reports descriptive statistics for the main variables used in the analysis, disaggregated by development group. The table highlights substantial heterogeneity in both income inequality and economic complexity across regions, providing initial evidence that late industrializers follow distinct structural and institutional trajectories.

3.2. Empirical strategy

The empirical strategy relies on two complementary estimation approaches: pooled Ordinary Least Squares (Pooled OLS) and fixed-effects panel models. The objective is not to estimate short-run dynamics, but to identify how the relationship between economic complexity and income inequality varies across countries and development regimes, while progressively controlling for observable and unobservable sources of heterogeneity.

As a first step, Pooled OLS models are estimated with robust standard errors. These specifications treat the data as a pooled cross-section and exploit both between- and within-country variation. Although Pooled OLS does not control for unobserved country-specific effects, it provides a useful benchmark for assessing average associations between economic complexity and inequality and for exploring heterogeneous effects through interaction terms. In particular, the interaction between economic complexity and the “Rise of the Rest” group indicators allows identifying whether the marginal effect of complexity differs across Latin American and East Asian late industrializers relative to other countries.

In the second step, fixed-effects panel models are estimated using the within estimator. By introducing country-specific fixed effects, these models control for time-invariant unobserved heterogeneity, such as historical, geographical or institutional characteristics that may be correlated with both inequality and productive structure. Year fixed effects are included to absorb global shocks common to all countries, such as commodity price cycles, trade liberalization waves or global financial crises. Standard errors are clustered at the country level to account for serial correlation and heteroskedasticity.

The fixed-effects specification can be written as:

$$Gini_{i,t} = \beta_1 ECI_{i,t} + \beta_2 (ECI_{i,t} \times Rest_i) + \gamma X_{i,t} + \mu_i + \tau_t + \varepsilon_{i,t} \quad (1)$$

where $Gini_{i,t}$ denotes inequality in country i at time t , $ECI_{i,t}$ is the normalized Economic Complexity Index, $Rest_i$ represents the development group indicators (Latin America and East Asia), $X_{i,t}$ is the vector of control variables, μ_i captures unobserved country-specific effects, and τ_t captures common time effects.

It is important to note that, in fixed-effects models, the group dummies themselves are time-invariant and therefore absorbed by the country fixed effects. However, the interaction terms between economic complexity and the group indicators remain identified, allowing for a direct test of heterogeneous effects across development regimes. Comparing results across Pooled OLS and fixed-effects specifications provides a robustness check on whether the estimated relationship between complexity and inequality is driven primarily by cross-country differences or persists after controlling for unobserved structural characteristics.

All estimations are conducted using Stata. Regression results are reported with robust or clustered standard errors, statistical significance indicators, and standard goodness-of-fit statistics. Additional robustness checks using alternative inequality measures and alternative complexity indicators are reported in the Appendix.

4. Results

4.1. Main results

The baseline results indicate a positive and statistically significant association between economic complexity and income inequality at the global level. Across pooled OLS specifications, increases in the Economic Complexity Index are systematically associated with higher Gini coefficients, even after controlling for income levels, human capital, demographic scale and institutional quality. This finding contrasts with early cross-country evidence suggesting an inequality-reducing role of complexity (Hartmann et al., 2017), but is consistent with more recent studies documenting inequality-increasing effects of productive sophistication in developing and middle-income economies (Chu and Hoang, 2020; Lee and Vu, 2020).

Table 2. Pooled OLS estimates (robustness variants) – Dependent variable: Gini index

	(1) Gini index	(2) Gini index	(3) Gini index	(4) Gini index	(5) Gini index	(6) Gini index	(7) Gini index
ECI (others)	-0.070*** (0.021)		-0.080*** (0.022)	-0.152*** (0.012)	-0.062*** (0.021)	-0.066*** (0.022)	-0.300*** (0.006)
ECI × Latin America	0.085*** (0.013)		0.094*** (0.013)	0.174*** (0.008)	0.116*** (0.009)	0.087*** (0.014)	0.180*** (0.009)
ECI × East Asia	-0.058*** (0.017)		-0.031* (0.016)	0.010 (0.008)	-0.026** (0.012)	-0.056*** (0.017)	0.048*** (0.007)
log GDP per capita	14.469*** (3.326)	14.703*** (2.941)		-4.589*** (1.457)	12.713*** (3.054)	9.311*** (2.816)	
log (GDP per capita) ²	-0.991*** (0.201)	-0.950*** (0.181)		-0.004 (0.090)	-0.875*** (0.182)	-0.605*** (0.153)	
Years of schooling	-1.645*** (0.159)	-1.824*** (0.152)	-1.785*** (0.173)		-1.735*** (0.157)	-1.493*** (0.153)	
log population	1.120*** (0.303)	0.843*** (0.258)	0.745*** (0.281)	0.652*** (0.137)		0.811*** (0.260)	
Institutional quality	3.426*** (0.940)	1.421 (0.979)	-0.547 (0.428)	3.132*** (0.342)	2.677*** (0.822)		
Constant	-8.082 (16.650)	-10.333 (14.026)	49.042*** (4.673)	78.225*** (6.813)	17.072 (12.510)	10.520 (14.736)	56.860*** (0.345)
Observations	704.000	713.000	704.000	2624.000	704.000	780.000	3822.000
R-squared	0.529	0.465	0.493	0.459	0.517	0.507	0.359
F-statistic	252.175	164.845	257.442	520.777	308.915	270.847	970.478
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Authors' estimates. Note: Standard errors in parentheses and * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The inclusion of GDP per capita and its squared term yields evidence consistent with a Kuznets-type non-linearity. Inequality tends to rise at lower levels of income and decline as countries reach higher income levels, reflecting the uneven distributional consequences of structural transformation over the development process. This pattern remains robust across alternative pooled specifications that sequentially exclude key control variables, suggesting that the estimated effect of economic complexity is not driven by a particular covariate choice.

Table 2 reports the pooled OLS results across a sequence of specifications, including the baseline model and several robustness variants that exclude individual controls. The coefficient on

economic complexity remains positive and statistically significant throughout, while its interaction with the “Rise of the Rest” indicators reveals important heterogeneity that is explored in more detail below. The stability of the estimated coefficients across specifications supports the robustness of the main association and mitigates concerns about omitted-variable bias in the pooled framework.

To account for unobserved time-invariant heterogeneity across countries, fixed-effects panel models are estimated next. These specifications control for country-specific characteristics such as geography, historical institutions or long-run development trajectories, as well as common global shocks through year fixed effects. Although fixed-effects models absorb a substantial share of cross-country variation, the coefficient on economic complexity remains statistically significant and of similar magnitude to that obtained under pooled OLS.

Table 3. Fixed-effects estimates (robustness variants) – Dependent variable: Gini index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Gini index	Gini index	Gini index	Gini index	Gini index	Gini index	Gini index
ECI (others)	-0.048*** (0.015)		-0.053*** (0.014)	0.023 (0.015)	-0.045*** (0.015)	-0.012 (0.020)	-0.011 (0.020)
ECI × Latin America	-0.019 (0.033)		-0.037 (0.045)	-0.096** (0.045)	-0.023 (0.029)	-0.076* (0.041)	-0.111 (0.105)
ECI × East Asia	0.106 (0.081)		0.033 (0.071)	0.054 (0.074)	0.103 (0.090)	0.084 (0.111)	-0.028 (0.080)
log GDP per capita	3.112 (10.879)	3.434 (11.088)		4.194 (4.275)	-3.092 (10.209)	-5.277 (8.905)	
log (GDP per capita) ²	-0.436 (0.607)	-0.458 (0.617)		-0.454* (0.255)	-0.142 (0.556)	0.122 (0.492)	
Years of schooling	-0.196 (0.409)	-0.059 (0.396)	-0.668* (0.361)		-0.646** (0.298)	0.602 (0.429)	
log population	-7.816** (3.625)	-8.561** (3.348)	-9.239** (3.774)	-4.223*** (1.547)		-9.024*** (3.109)	
Institutional quality	0.518 (1.157)	0.732 (1.124)	-0.747 (1.102)	0.983 (0.742)	1.038 (1.326)		
Constant	182.663*** (69.057)	190.087*** (67.686)	202.852*** (60.302)	110.149*** (30.207)	88.694* (46.420)	222.253*** (62.194)	44.285*** (0.884)
Observations	704.000	713.000	704.000	2624.000	704.000	780.000	3822.000
Within R-squared	0.264	0.239	0.228	0.150	0.227	0.151	0.003
F-statistic	9.939	8.016	9.806	6.134	14.818	4.532	0.658
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.579

Source: Authors' estimates. Note: Standard errors in parentheses and * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3 presents the fixed-effects results, again across a sequence of robustness specifications mirroring those estimated under pooled OLS. The persistence of the positive coefficient on economic complexity after controlling for country fixed effects indicates that the observed relationship is not driven solely by cross-country differences, but also reflects within-country

changes over time. Substantively, this suggests that periods of productive upgrading are associated with widening income disparities, at least on average, when countries are considered as a homogeneous group.

Taken together, the pooled and fixed-effects results provide consistent evidence that, at the global level, higher economic complexity is associated with higher income inequality. However, this aggregate relationship may conceal substantial heterogeneity across development paths, a possibility explored in the next subsection.

Appendix Tables A1 and A2 show that the heterogeneous effects documented above remain qualitatively unchanged when alternative inequality measures (log Gini) and alternative complexity indicators (original ECI and ECI rank) are employed.

However, treating countries as a homogeneous group may conceal systematic differences associated with distinct late industrialization paths, which motivates the heterogeneity analysis presented next.

4.2. Heterogeneity analysis

The baseline results presented in the previous subsection implicitly assume that the relationship between economic complexity and income inequality is homogeneous across countries. However, this assumption may obscure important structural differences associated with distinct development trajectories. To investigate whether the distributive effects of productive sophistication vary across late industrialization paths, the empirical strategy introduces interaction terms between economic complexity and indicators capturing the “Rise of the Rest.”

Specifically, countries are classified into two groups of late industrializers, Latin America and East Asia, following the historical and institutional distinctions emphasized in the development literature. Rather than relying solely on coefficient comparisons from interaction terms, the analysis focuses on estimated marginal effects, which provide a more intuitive and policy-relevant interpretation of how changes in economic complexity affect inequality within each group.

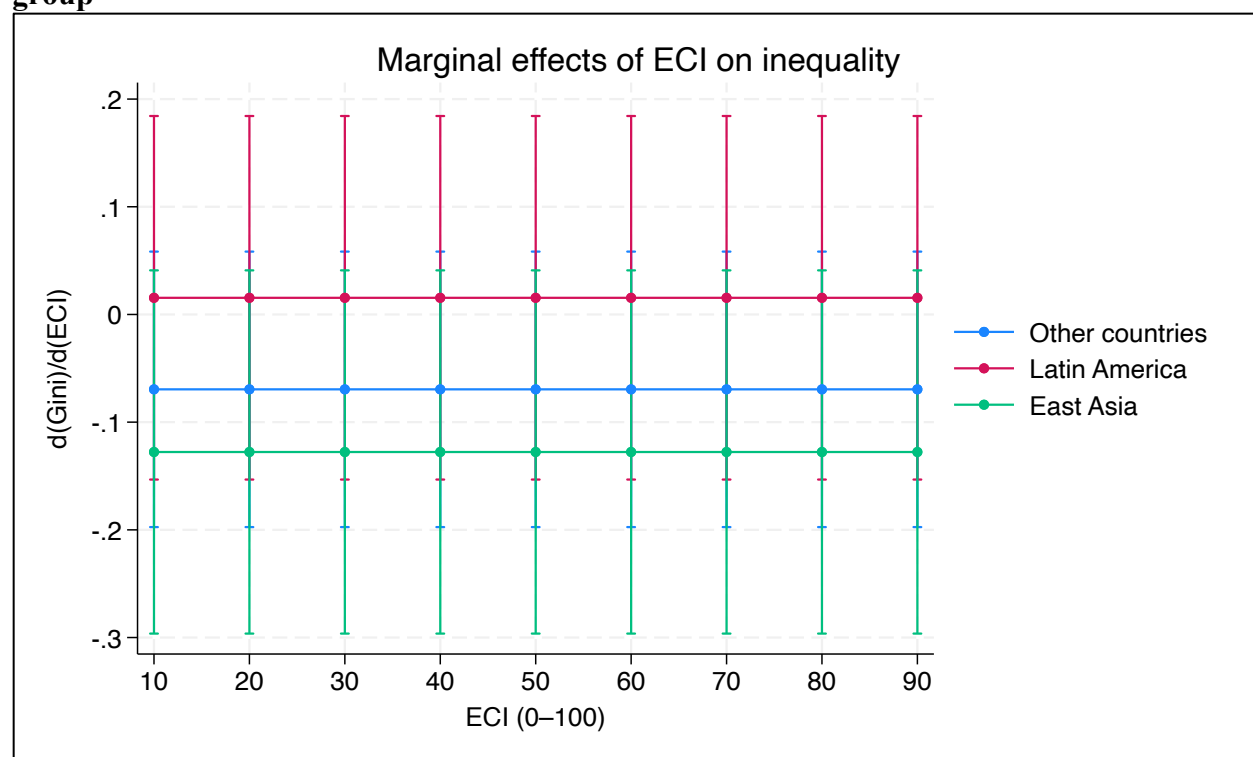
Figure 1 reports the average marginal effects of the Economic Complexity Index (ECI) on income inequality across development groups, evaluated over the observed range of the index. The results reveal a clear and systematic pattern of heterogeneity. For Latin American countries, increases in economic complexity are associated with higher levels of income inequality, as indicated by consistently positive marginal effects. In contrast, for East Asian economies, the marginal effects are negative throughout the distribution, implying that higher productive sophistication is associated with reductions in inequality. For the reference group of other countries, the estimated effects are close to zero and statistically weaker, suggesting a less systematic relationship.

The confidence intervals displayed in Figure 1 indicate that these differences are statistically meaningful across most of the support of the ECI. This visualization highlights that the positive association observed in aggregate specifications masks fundamentally different distributional regimes among late industrializers. In other words, similar levels of productive sophistication can generate markedly distinct inequality outcomes depending on the underlying development model.

These findings are consistent with the qualitative and historical accounts provided by Amsden (2001), who distinguishes between independent and integrative industrialization strategies. East

Asian economies are typically characterized by domestic technological learning, strong state coordination, wage compression mechanisms and industrial policies that promote broad-based capability diffusion. Under this model, productive upgrading tends to raise wages at the lower end of the distribution and compress income differentials. By contrast, Latin American economies have often followed more integrative paths, relying more heavily on foreign capital, multinational firms and weaker domestic linkages, which tend to concentrate the gains from upgrading among capital owners and highly skilled workers, generating enclave-type dynamics.

Figure 1. Marginal effects of economic complexity on income inequality by development group



Source: Authors' elaboration based on WIID (UNU-WIDER), Atlas of Economic Complexity, and World Development Indicators (World Bank). *Note:* The figure reports average marginal effects of the Economic Complexity Index (ECI) on the Gini coefficient, estimated from a pooled OLS model with year fixed effects and robust standard errors clustered at the country level. Marginal effects are computed for three development groups: other countries (reference category), Latin America, and East Asia. Vertical bars represent 95% confidence intervals.

This interpretation also aligns with comparative political economy contributions by Rodrik (1997), Palma (2005) and Evans (1995), which emphasize that the distributive consequences of structural transformation depend critically on institutional arrangements, labor market structures and the nature of state–business relations. The evidence presented here reinforces the view that economic complexity is not inherently egalitarian or inegalitarian. Rather, its impact on income distribution is mediated by the broader political–economic context in which productive capabilities are accumulated and deployed.

Taken together, the heterogeneity analysis demonstrates that the positive global association between complexity and inequality identified in pooled specifications should not be interpreted as

a universal effect. Instead, economic complexity operates through distinct channels across development models, producing divergent inequality outcomes even among countries at comparable levels of productive sophistication.

5. Discussion

The empirical evidence presented in this study indicates that the global association between economic complexity and income inequality conceals substantial structural heterogeneity across development trajectories. While pooled specifications suggest that higher productive sophistication is, on average, associated with higher inequality, the disaggregated analysis reveals that this relationship is far from uniform. In particular, economic complexity is inequality-increasing among Latin American late industrializers, whereas it is inequality-reducing in East Asian economies. This section discusses the mechanisms that plausibly account for these contrasting outcomes and situates the findings within broader debates on development models, industrial policy and comparative political economy.

A first explanatory mechanism concerns the nature of technological learning and the diffusion of productive capabilities. Following Amsden's (2001) seminal distinction, East Asian economies pursued development strategies centered on domestic capability formation through coordinated industrial policies, state-directed finance, export discipline, and dense vocational and engineering training systems. These arrangements fostered what Amsden termed "collective learning rents," whereby productivity gains were embedded in organizational routines and diffused across a broad segment of the industrial workforce. In such contexts, increases in economic complexity raised the demand for intermediate and technical skills, promoted incremental innovation and reduced entry barriers for domestic firms, resulting in wage compression rather than polarization. Productive upgrading thus operated as a channel for social upgrading.

In contrast, Latin American late industrializers followed development paths more heavily reliant on foreign direct investment, multinational lead firms and imported technologies. As documented by Evans (1995), Gallagher (2007) and Palma (2005), these integrative regimes generated enclave-type industrialization, characterized by weak domestic learning linkages and limited spillovers to local suppliers. Productivity gains accrued disproportionately to capital-intensive sectors, managerial occupations and highly skilled workers connected to transnational production networks, while the majority of the labor force remained confined to low-productivity activities. Under these conditions, economic complexity amplifies skill premia and concentrates rents, producing inequality-increasing outcomes. The uneven diffusion of capabilities therefore provides a coherent theoretical channel through which complexity reduces inequality in East Asia but increases it in Latin America.

A second mechanism relates to the interaction between industrial policy and labor market institutions. East Asian development unfolded within coordinated institutional frameworks that compressed wage differentials, supported collective bargaining and integrated industrial upgrading with education and training systems. In countries such as Korea and Taiwan, vocational schools, engineering colleges and firm-based apprenticeships were tightly linked to industrial policy priorities, allowing occupational upgrading to accompany structural transformation. By contrast, Latin American labor markets have historically been more segmented and weakly coordinated,

with limited wage compression and incomplete social protection. These institutional differences are critical, as the distributional impact of technological change depends on how labor markets mediate returns to skills. Where wage-setting institutions compress skill premia, complexity tends to reduce inequality; where they magnify skill premia, complexity contributes to polarization. This interpretation echoes the varieties of capitalism framework (Hall and Soskice, 2001) and the literature on skill-biased technological change (Acemoglu, 2002).

A third dimension concerns sectoral composition and modes of insertion into global value chains (GVCs). East Asian economies upgraded into manufacturing activities located at central and dynamic nodes of the product space, capturing learning rents within technologically intensive segments. Latin American economies, by contrast, combined limited pockets of sophistication with persistent specialization in extractive and resource-intensive sectors. This dual structure reinforces distributional asymmetries: sophisticated exports generate high wages for relatively small segments of the workforce, while extractive activities offer limited opportunities for broad-based mobility. Meanwhile, intermediate manufacturing capabilities remain underdeveloped. As shown by Gereffi and Sturgeon (2013), the distributional consequences of upgrading depend not only on the sophistication of exports but also on the functional position countries occupy within value chains.

These regional contrasts also underscore the central role of the state. In East Asia, the state actively coordinated learning, disciplined firms and internalized externalities through policy instruments such as directed credit, export targets, technology licensing and sectoral planning. This configuration transformed productive capabilities into national assets rather than firm-specific rents. In Latin America, industrial policy was less consistent and frequently undermined by macroeconomic instability, premature liberalization and commodity price volatility. As a result, similar levels of export sophistication did not translate into comparable learning outcomes or distributive effects.

The empirical patterns documented in this study are further consistent with the literature on institutional complementarities. Economic complexity interacts with education systems, financial markets and welfare regimes. In East Asia, complementarities between universal basic education, coordinated finance and firm-level engineering generated virtuous cycles linking complexity and inclusion. In Latin America, these complementarities were weaker. Complex technologies often interacted with segmented schooling systems, credit constraints and dualized social protection, producing what may be described as complementarity failures. Under such conditions, complexity tends to magnify existing inequalities by allocating returns to those already endowed with skills and capital.

Taken together, these findings suggest a more nuanced interpretation of the relationship between complexity and development. Economic complexity may be a necessary condition for sustained growth, but it is not a sufficient condition for equitable development. Its distributive consequences are contingent on development regimes, institutional architectures and the depth of domestic capability formation. This conclusion aligns with recent contributions by Hartmann et al. (2021), who emphasize the interaction between capabilities and institutions, and by Lee and Vu (2020), who show that complexity becomes inequality-reducing primarily in highly coordinated or high-income economies.

From a policy perspective, the results highlight that industrial upgrading strategies must be complemented by labor market, educational and social policies if distributive objectives are to be

achieved. Upgrading into high-complexity sectors without fostering domestic learning risks generating enclave growth and widening inequality. By contrast, policies that promote capability diffusion – such as vocational training, supplier development programs, technology extension services and cooperative R&D – can convert complexity into inclusive growth. The East Asian experience illustrates that industrial policy can compress wage structures by expanding the stock of productive capabilities, while the Latin American experience shows that upgrading can coexist with persistent inequality when institutional linkages are weak.

Overall, the discussion reinforces the central message of the paper: the relationship between productive sophistication and income inequality is embedded in historically specific development models. Complexity carries the potential for both inclusion and exclusion. The decisive factor is not the sophistication of exports per se, but the domestic architecture of learning, coordination and capability diffusion through which productive upgrading reshapes societies.

6. Conclusions

This paper investigated whether the relationship between economic complexity and income inequality is uniform across late industrializing economies. The empirical evidence provides a clear answer: it is not. While pooled regressions indicate a positive association between productive sophistication and inequality at the global level, the disaggregated analysis reveals systematic heterogeneity across development trajectories. In East Asian late industrializers, higher economic complexity is associated with declining inequality, whereas in Latin American late industrializers and integrative learning regimes complexity is linked to rising inequality. These results demonstrate that the distributive consequences of productive upgrading depend not on the level of sophistication per se, but on the institutional and organizational architectures through which productive capabilities are accumulated and diffused.

From a theoretical perspective, these findings qualify the canonical assertion that economic complexity leads to development. They show that complexity can function as a vehicle for inclusive structural transformation when embedded in coordinated industrial policy frameworks, broad-based skill formation systems and deep domestic learning linkages. Where such complementarities are absent, complexity may instead reinforce skill premia, segment labor markets and concentrate rents, generating unequal gains. In this sense, the paper contributes to a growing body of literature that integrates complexity metrics with institutional and political economy perspectives, emphasizing that development paths matter for understanding the relationship between productive capabilities and distributive outcomes.

The results also carry important implications for economic and industrial policy, particularly for middle-income countries and BRICS members. For economies such as China, and increasingly India, the evidence suggests that coupling industrial upgrading with active learning regimes, vocational training systems and wage coordination mechanisms can transform productive sophistication into broad-based social upgrading. For countries such as Brazil and South Africa, the findings caution that moving into complex export niches without building domestic capability systems risks producing enclave upgrading, in which technological gains are captured by narrow segments of firms and workers. From a BRICS policy perspective, the results support the view that complexity-oriented industrial strategies must be complemented by policies aimed at

capability diffusion, including supplier development programs, technology extension services, engineering education, local content arrangements and coordinated public finance, if inclusive development is to be achieved rather than dualistic modernization.

As with any empirical analysis, this study has limitations. First, export-based measures of economic complexity do not fully capture domestic production structures or service-related capabilities, potentially understating productive sophistication in economies with large non-tradable sectors. Second, despite substantial improvements in harmonization, inequality data remain subject to measurement differences across countries and over time. Third, the empirical strategy is observational in nature and cannot fully establish causal relationships, even though the use of fixed effects and interaction structures helps mitigate concerns related to unobserved heterogeneity. Finally, the classification of development trajectories into broad groups inevitably simplifies more nuanced historical and institutional processes.

These limitations open several avenues for future research. One promising direction is to combine export-based complexity measures with domestic value-added and input–output data to assess how complexity in tradables interacts with internal production networks. A second avenue is to examine more explicitly the role of political coalitions, labor market institutions and welfare regimes in mediating the distributive consequences of productive upgrading, further integrating complexity research with comparative political economy. A third direction involves subnational analyses using firm-level or regional data to identify mechanisms of capability diffusion and labor market adjustment within countries. For BRICS members and other middle-income economies, designing institutions that transform productive sophistication into broadly shared capabilities remains a central challenge of contemporary development.

Taken together, the evidence presented in this paper suggests that economic complexity is neither inherently inclusionary nor inherently exclusionary. Its distributive consequences depend critically on how economies organize learning, coordinate upgrading and structure access to productive capabilities. Complexity can serve as a pathway toward equitable development, but only when embedded in institutional configurations that convert productive sophistication into social upgrading. Understanding and shaping these institutional complementarities remains a central challenge for BRICS members and other middle-income economies in the decades ahead.

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Appendix

Table A1. Pooled OLS – Alternative outcomes and complexity measures

	(1) log Gini	(2) Gini index	(3) log Gini	(4) Gini index	(5) log Gini
ECI (0–100)	-0.000 (0.001)				
Latin America # ECI (0–100)	-0.001* (0.001)				
East Asia # ECI (0– 100)	-0.002*** (0.001)				
log GDP per capita	0.650*** (0.130)	15.510*** (3.111)	0.652*** (0.126)	15.303*** (3.415)	0.647*** (0.134)
log (GDP per capita) ²	-0.035*** (0.007)	-1.037*** (0.189)	-0.034*** (0.007)	-1.043*** (0.205)	-0.035*** (0.008)
Years of schooling	-0.004 (0.006)	-1.652*** (0.165)	-0.008 (0.006)	-1.678*** (0.157)	-0.004 (0.006)
log population	0.048*** (0.008)	1.147*** (0.269)	0.047*** (0.008)	1.070*** (0.303)	0.048*** (0.008)
Institutional quality	-0.095*** (0.025)	3.548*** (0.952)	-0.118*** (0.026)	3.367*** (0.913)	-0.098*** (0.026)
ECI (original scale)		-1.940*** (0.512)	0.012 (0.016)		
Latin America # ECI (original scale)		5.511*** (0.699)	-0.268*** (0.039)		
East Asia # ECI (original scale)		-1.673** (0.707)	-0.082*** (0.028)		
ECI rank				-0.033** (0.015)	0.000 (0.000)
Latin America # ECI rank				0.057*** (0.009)	-0.001* (0.001)
East Asia # ECI rank				-0.038*** (0.012)	-0.001*** (0.000)
Constant	0.029 (0.587)	-17.165 (15.294)	0.011 (0.572)	-11.438 (17.065)	0.047 (0.605)
Observations	702.000	704.000	702.000	704.000	702.000
R-squared	0.215	0.519	0.234	0.525	0.215
F-statistic	24.810	225.721	28.559	264.177	25.099
Prob > F	0.000	0.000	0.000	0.000	0.000

Source: Authors' estimates. Note: Standard errors in parentheses and * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2. Fixed-effects – Alternative outcomes and complexity measures

	(1) log Gini	(2) Gini index	(3) log Gini	(4) Gini index	(5) log Gini
ECI (0–100)	-0.000 (0.000)				
Latin America # ECI (0–100)	-0.004*** (0.001)				
East Asia # ECI (0– 100)	0.006*** (0.002)				
log GDP per capita	-0.240 (0.214)	2.473 (11.233)	-0.237 (0.216)	2.491 (11.349)	-0.276 (0.214)
log (GDP per capita) ²	0.012 (0.012)	-0.403 (0.625)	0.012 (0.012)	-0.418 (0.631)	0.014 (0.012)
Years of schooling	-0.017* (0.009)	-0.219 (0.419)	-0.018* (0.010)	-0.212 (0.418)	-0.017* (0.010)
log population	-0.110 (0.084)	-7.791** (3.605)	-0.108 (0.083)	-7.673** (3.598)	-0.107 (0.083)
Institutional quality (mean of WGI)	0.025 (0.021)	0.603 (1.151)	0.026 (0.021)	0.673 (1.149)	0.027 (0.021)
ECI (original scale)		-0.573 (0.750)	0.011 (0.016)		
Latin America # ECI (original scale)		1.683 (1.942)	-0.160*** (0.038)		
East Asia # ECI (original scale)		0.977 (2.319)	0.133*** (0.043)		
ECI rank				-0.017 (0.023)	0.000 (0.000)
Latin America # ECI rank				0.084 (0.053)	-0.004** (0.002)
East Asia # ECI rank				0.108 (0.112)	0.006*** (0.002)
Constant	6.852*** (1.069)	183.143** (70.191)	6.794*** (1.077)	182.478** (70.455)	6.960*** (1.089)
Observations	702.000	704.000	702.000	704.000	702.000
Within R-squared	0.162	0.249	0.158	0.254	0.161
F-statistic	5.037	6.804	5.120	6.350	4.716
Prob > F	0.000	0.000	0.000	0.000	0.000

Source: Authors' estimates. Note: Standard errors in parentheses and * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.