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HETEROGENEOUS EFFECT OF FINANCIAL INCLUSION ON ECONOMIC COMPLEXITY IN DEVELOPING COUNTRIES

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Abstract
This paper investigates the heterogeneous effect of financial inclusion on economic complexity in developing countries. The empirical analysis relies on quantile via moments method, using data from 71 developing countries over the period 2011-2021. The results show that financial inclusion significantly increases economic complexity. Moreover, the positive effect of financial inclusion on economic complexity is higher in countries with high level of economic complexity and lower in countries with low level of economic complexity. These findings imply that the ability of developing countries to produce diversified and increasingly complex products depends on their level of financial inclusion. Therefore, financial inclusion promotion should be taken into account in the implementation and the formulation of policies in order to facilitate structural transformation process in developing countries.

Keywords: developing countries, heterogeneous effect, financial inclusion, economic complexity

1. Introduction

Economic complexity measures the amount of knowledge that is materialized in a country's production system (Hausmann and al., 2007; Hidalgo and Hausmann, 2009; Hausmann et al., 2014). The economic complexity indicator developed by Hidalgo and Hausmann (2009) measures the complexity of a country's productive structure based on the products it exports (Hidalgo and Hausmann, 2009; Hausmann and al., 2014). It reflects the diversification and ubiquity of the products exported by the country (Tacchella et al., 2012). A product is considered to be complex if it requires many exclusive capabilities that can be inferred from the ubiquity of that product and the diversity of exports by its main exporters. Thus, only a few countries, possessing many exclusive skills, export complex products (Poncet and Waldemar, 2013), which gives them a competitive advantage over others. Therefore, economic complexity is closely linked to a country's level of development and future economic growth (Hausmann and al., 2011; Hidalgo, 2021). It accelerates the process of structural transformation in developing countries (Hidalgo, 2021; McMillan and Rodrik, 2011) and contributes to reducing poverty and inequality (Hartmann et al., 2017; Lee and Vu, 2020). The issues surrounding economic complexity make it pertinent to analyze its determinants.

Previous works has highlighted some determinants of economic complexity, including internet use (Lapatinas, 2019), institutional quality (Hoang and Chu, 2023; Nguyen and al.,

2023), international financial flows (Ogbuabor and al., 2023). Despite these contributions on the determinants of economic complexity, very little attention has been paid to the role of financial inclusion. Our paper fills this gap by investigating the heterogeneous effect of financial inclusion on economic complexity. Fan et al. (2015) showed that the introduction of innovative products requires considerable investment. In this context, improving financial inclusion could play an important role as a tool for financing innovation (Nguyen and Su, 2021). Theoretically, Fan and al. (2015) model establishes a strong link between economic complexity and financial inclusion. Indeed, their model shows that credit constraints force firms to produce low-quality products. It is therefore expected that improving financial inclusion will enable firms to access credit at low cost (Svirydzenka, 2016; Lee and al., 2020; Canh and Thanh, 2020).

While theoretically, improved financial inclusion is expected to improve the economic complexity of countries, few empirical studies have focused on analyzing this link. It should be noted that some studies showed that financial development improves economic complexity (Zhu et al., 2020; Chu, 2020; Nguyen and Su, 2021; Emeka et al.,2024). These empirical studies make a major contribution to the analysis of the determinants of economic complexity. However, they do not shed sufficient light on the role of financial inclusion, as an indicator of financial development, in improving complexity, particularly in developing countries.

This research aims to analyze the effect of financial inclusion on economic complexity in developing countries. It makes two major contributions to the economic literature on the determinants of economic complexity in developing countries. First, unlike previous studies that has analyzed the effect of financial development on economic complexity (Nguyen and Su, 2021; Njangang et al., 2021; Emeka and al.,2024), this research analyzes the effect of financial inclusion as a component of financial development on economic complexity. In analyzing the effect of financial development economic complexity, previous studies do not shed sufficient light on the effect of financial development components, notably financial inclusion on economic complexity. Second, previous studies have mainly relied on a single model to analyze the effect of financial development on economic complexity. As a result, these studies assume that the regression parameters are homogeneous over the entire distribution of economic complexity. These works do not therefore take into account the heterogeneity that exists between countries in terms of their level of economic complexity. Also, unlike previous studies which assume that the effect of financial development on economic complexity is linear, we take into account the non-linearity of the effect of financial inclusion on economic complexity. Indeed, this research takes into account both the heterogeneity and non-linearity of financial inclusion effect on economic complexity using quantile via moments regression method (Machado and Silva, 2019).

The remainder of the paper is organized into four sections. Section 2 is devoted to the literature review. Section 3 outlines the methodology and data employed. Section 4 presents and discusses the results. Section 5 concludes the paper and presents policy implications.

2. Literature review

In economic literature, a theoretical link has been clearly established between the financial sphere and economic complexity, thanks to models by Kletzer and Bardhan (1987) and

Baldwin (1989). These authors develop models in which financial development is the fundamental element of each country's performance. Intuitively, their model implies that financial development mobilizes savings, reduces corporate transaction costs, diversifies technological risk and promotes access to information on investment projects. As a result, the development of the financial system not only encourages investment, but also makes it possible to select the most profitable projects. It is expected that countries that adopt a national policy to promote the development of the financial system will encourage the emergence of businesses and, in turn, the production of complex and sophisticated products (Ebireri, 2014).

Thus, the development of the financial system could be an effective instrument for promoting economic complexity. The financial sector plays an important role in terms of allocating scarce resources. Indeed, the development of the financial market creates a favorable environment for the expansion of innovative projects, which in turn enables the sophistication of the economic system. These effects are achieved through several channels. First, financial development reduces the cost of access to credit (Svirydzenka 2016). Second, financial development promotes access to the credit needed to finance investment in research and development (Maskus and al., 2012) and innovation (Hsu and al., 2014).

Empirically, a number of studies have examined the link between the financial sphere and economic complexity, albeit with controversial results. On the one hand, some find that financial development promotes economic complexity (Chu, 2020; Nguyen and Su, 2021; Emeka et al.,2024). For example, Chu (2020), using the GMM-system method applied to data covering 94 countries over the period 1968-2015, shows that the development of the banking system and stock market improves the economic complexity of the countries considered. Similarly, Nguyen and Su (2021) show using the fully modified ordinary least squares method and the GMM method that access to financial services and financial sector efficiency have a positive and significant impact on economic complexity in 86 countries over the period 20022017. Mobilizing data on 118 countries over the period 1995-2018, using GMM-system method, Avom and Ndoya (2024) find that financial development is one of the channels through which a country's stability improves its level of complexity. In the same vein, Njangang et al. (2021) mobilizing data on 24 African countries between 1983 and 2017. Using the DriscollKraay and GMM-system methods, they show that financial development boosts economic complexity in Africa. However, Zhu et al (2020), using the GMM-system method on panel data covering 50 countries between 1990 and 2016, show that financial development has little or no significant positive impact on innovation. Nguyen and al (2020) analyze the impact of financial development overall and by component, as well as that of patents, on economic complexity in 52 countries. They use several estimation methods. Their results show a contrasting effect of financial development on economic complexity. Financial development, taken as a whole, improves economic complexity. However, analysis by component reveals divergent effects: financial institutions, taken as a whole, have a non-significant impact, the deepening and efficiency of financial institutions contribute positively to economic complexity, while accessibility to financial services has a significant negative impact on economic complexity.

The literature review shows that some studies highlighted the role of financial development and financial markets in improving the economic complexity of countries. However, few

studies have focused exclusively on the effects of financial inclusion on economic complexity, particularly in developing countries. The present research aims to fill this gap by examining the effects of financial inclusion on economic complexity in developing countries. Moreover, while previous work tends to show, through various econometric techniques, that financial development promotes economic complexity, it does have some limitations. In fact, most of this work is based on a single model for analyzing the effect of financial development on economic complexity, assuming that the effect of financial development on economic complexity is constant over the entire distribution of the latter. However, there is a wide disparity in the level of economic complexity in different countries (Ndoya and al., 2024). As a result, these methods do not take into consideration this possible heterogeneity in the effect of financial development on the distribution of economic complexity.

3. Methodology

3.1 Empirical specification and estimation strategy

This section presents the empirical model used and the estimation strategy.

3.1.1. Estimation strategy

The model used to analyze the heterogeneous effect of financial inclusion on economic complexity is written as follows:

$$CE = f(IF, X) \qquad (1)$$

Equation (1) states that economic complexity is a function of financial inclusion and control variables (X). These control variables include: GDP per capita, natural resource rents, trade openness and foreign direct investment.

To analyze the effect of financial inclusion on economic complexity in developing countries, we use quantile via moments regression method with fixed effect. This method has the advantage of being more robust than many estimators, notably ordinary least squares. Indeed, conventional linear regression (ordinary least squares) is based on the assumption that the relationships with the explanatory variables are uniformly distributed around the mean of the explained variable. The idea is to predict the conditional mean of the explained variable from the estimated parameters of the model. In some cases, however, it proves difficult to model the conditional mean, particularly when the distribution of the error terms does not follow a normal distribution, or when the error terms are heteroskedastic. In this context, quantile regressions offer an alternative to ordinary least squares regression. Initially developed by Koenker and Bassett (1978), quantile regression allows to study the effects of explanatory variables on different quantiles of the dependent variable distribution. The quantile regression method reinforces the information obtained and helps to analyze heterogeneous effect. Indeed, quantile regressions make it possible to describe and analyze the entire conditional distribution of the dependent variable. In fact, unlike the ordinary least squares, which is based on estimating the mean of the dependent variable, the quantile regression approach involves estimating the conditional quantiles of the dependent variable. Furthermore, the quantile regression approach is robust to outliers. It is suitable for censored or truncated variables, for extreme values and also in the presence of heterogeneity and nonlinearity in a

panel data context. As a result, this approach appears to be suitable for the evaluation of public policies (Lokonon, 2023).

In this paper, this method is appropriate because it enriches the quantitative description of the effect of financial inclusion on economic complexity in developing countries. We analyze the effects of the model's independent variables at the 10%, 25%, 50%, 75% and 90% quantiles of the dependent variable distribution, considering heterogeneity between countries. Specifically, this research uses the estimator proposed by Machado and Silva (2019). The latter present two particular contexts in which their approach is suitable. These are panel data models with individual effects on the one hand, and models with endogenous explanatory variables on the other. Like classical quantile regressions, their model can estimate conditional quantiles based on the evaluation of conditional means. In the case of quantile regression, however, conditional quantiles are obtained using the method of moments, by combining estimates of the location and scaling functions of the variable. The conditional mean and the conditional scaling function provide information comparable to that of conventional quantile regressions. They enable us to determine the influence of the explanatory variables on the conditional distribution as a whole. Thus, the estimator proposed by Machado and Silva (2019) is particularly suitable for panel data models with individual effects, as it differentiates individual effects while estimating regression quantiles. In addition, this estimator deals with endogeneity issue (Machado and Silva, 2019).

3.1.2. Model specification

The estimator thus proposed by Machado and Silva (2019) is written as an equation:

$$CE_{it} = \alpha_i + X_{it}^{'}\beta + (\delta_i + Z_{it}^{'}\gamma)U_{it} \qquad (2)$$

In equation (2), CE_{it} represents the economic complexity, X_{it} the set of independent, independent and identically distributed variables for each individual i at date. U_{it} follows the same distribution as X_{it} and normalized X_{it} so as to fulfill the conditions necessary for estimating the quantile regression proposed by Machado and Silva (2019).

$(\alpha, \beta, ^{'} \delta, \gamma^{'})^{'}$ are unknown parameters to be estimated.

$(\alpha_i,\ \delta_i)$ avec $i = 1,...,n$ represent individual fixed effects;

$$\text{The probability } P\left\{\delta_i + Z_{it}^{'}\gamma \succ 0\right\}) = 1$$

Z_l is a known and differentiable transformation of X, given by:

$$Z_l = Z_l(X) \qquad l = 1,...,n$$

The quantile regression of equation (2) gives:

$$Q_{CE}(\tau / X_{it}) = (\alpha_i + \delta_i q(\tau)) + X_{it}^{'}\beta + Z_{it}^{'}\gamma q(\tau) \qquad (3)$$

$Q_{CE}(\tau / X_{it})$ represents the quantile distribution of economic complexity (CE_{it}).

$\alpha_i(\tau) \equiv \alpha_i + \delta_i(q)$ represents the fixed effect of quantile-τ for individual i. $q(\tau)$ is the τ -th quantile. It is estimated by solving the following optimization problem:

$$\min_q = \sum_i \sum_t \rho_\tau (R_{it} - (\delta_i + Z_{it}^{'}\ \gamma)q) \qquad (4)$$

Where $\rho_\tau(A) = (\tau - 1)AI\left\{A \le 0\right\} + TAI\left\{A \succ 0\right\}$ represents the check function.

3.2. Justification for the choice of control variables

GDP per capita is used as a control variable. Theoretically, increasing national income per capita improves economic complexity, especially when driven by the export of highly sophisticated products (Gnangnon, 2021). Natural resources rents can provide financial resource to exporting countries to producing highly sophisticated and diversified products (Bahar and Santos, 2018; Ross, 2019; Djimeu and Omgba, 2019). Trade openness is also used as a control variable. Indeed, according to the new theory of international trade, trade openness leads certain companies to specialize in the production of certain highly sophisticated products and to take advantage of increasing returns to scale (Dixit and Norman, 1980; Krugman, 1979; 1980). It can also enable the host country to easily access and adopt technologies developed abroad (Keller, 2004). Foreign direct investment promotes economic complexity by facilitating the transfer of technology and know-how to the host country (Antonietti and Franco, 2021; Gómez-Zaldívar and al., 2021; Gnangnon, 2021; Ajide, 2024).

3.3. Data

The data used in this research covers 71 developing countries over the period 2011-2021 (see table 7 in the appendix for the list of countries). The choice of countries and period was dictated by data availability. Table 1 presents, describes and provides data sources for the variables used.

Table 1: Definition and sources of the main variables

Variables	Definition	Sources
Economic complexity	Reflects the diversification and ubiquity of products exported by countries. It reflects countries' level of structural transformation.	Atlas of economic complexity published by the Observatory of economic complexity
Financial inclusion	The proportion of individuals aged 15 and over with an account in a financial institution.	Global Financial Inclusion database, World Bank (2022)
GDP per capita	Gross domestic product per capita	World Bank (2024)
Natural resource rents	Natural resource rents include rents from natural gas, oil, coal and minerals, and forests. These rents are expressed as a share of GDP	World Bank (2024)
Trade openness	Trade openness is measured by the sum of exports and imports in relation to gross domestic product	World Bank (2024)
Foreign direct investment	Net investment inflows to acquire a lasting stake in an investment company operating in an economy other than that of the investor. This variable is expressed as a share of GDP	World Bank (2024)

Source: Authors

Table 2 presents the descriptive statistics for the variables. Over the period considered, the average economic complexity index is -0.478 on a scale from -2.5 to 2.5, where 2.5 represents the highest level of economic complexity. On average, the level of economic complexity is

relatively low in the sample of developing countries considered, reinforcing the need to analyze the determinants of economic complexity in these countries. In addition, the level of economic complexity is relatively less dispersed.

Table 2: Descriptive statistics for variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Economic complexity	284	-.478	.705	-2.442	1.349
Financial inclusion	262	40.297	23.592	.405	98.166
GDP per capita (logarithm)	284	7.877	.905	6.007	9.561
Natural resources rents	283	8.373	9.087	.003	51.844
Commercial opening	263	73.654	29.774	23.934	186.676
Foreign direct investment	284	4.639	7.173	-3.115	86.989

Source: Authors.

Table 3 shows the correlation of the variables. The information in this table mainly indicates an absence of multicollinearity between all the variables, as no correlation coefficient has a value greater than 0.7. Table 3 also shows that there is a positive correlation between financial inclusion and economic complexity. Furthermore, economic complexity is positively correlated with the control variables, notably GDP per capita and trade openness, while it is negatively correlated with natural resource rents and foreign direct investment.

Table 3: Variable correlation matrix

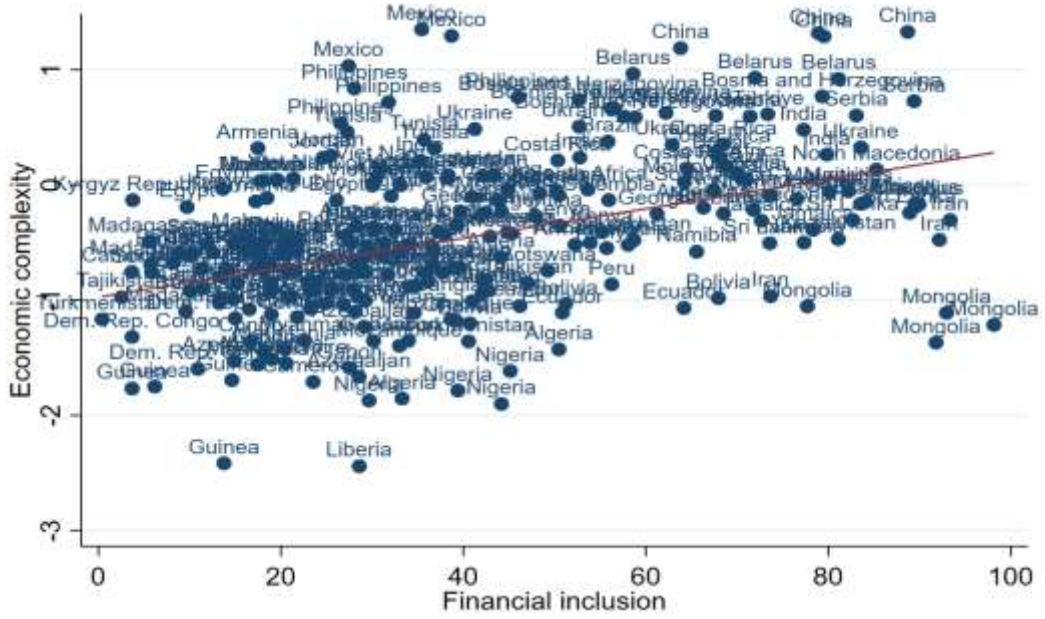
Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) Economic complexity	1.000					
(2) Financial inclusion	0.430***	1.000				
(3) GDP per capita (logarithm)	0.487***	0.638***	1.000			
(4) Natural resources rents	-0.523***	-0.194***	-0.199***	1.000		
(5) Trade openness	0.062	0.035	0.024	0.057	1.000	
(6) Foreign direct investment	-0.152**	-0.082	-0.176***	0.275***	0.397***	1.000

*Note: *** and ** denote significance at 1% and 5% level, respectively*

Source: Authors.

Figure 1 confirms the existence of a positive correlation between financial inclusion and economic complexity. In other words, a high level of financial inclusion is associated with a high level of economic complexity. However, this relationship does not imply causality. The results of the empirical estimations that will be presented in the next section provide us with a more solid understanding of the relationship between these two variables.

FIGURE 1 | Correlation between financial inclusion and economic complexity in developing countries.



Source: Authors

4. Empirical results

In this section, we present the results of our estimations. The results of the basic model are presented first, followed by robustness results.

4.1. Basic results

The results of the basic model are presented in Table 4.

Table 4: Effect of financial inclusion on economic complexity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	location	scale	qtile_10	qtile_25	qtile_50	qtile_75	qtile_90
Financial inclusion	0.00499***	3.78e-05	0.00493**	0.00495**	0.00498***	0.00502**	0.00505*
	(0.00188)	(0.00113)	(0.00229)	(0.00194)	(0.00185)	(0.00231)	(0.00284)
Log (GDP per capita)	0.229***	0.0572**	0.142**	0.180***	0.219***	0.282***	0.320***
	(0.0481)	(0.0289)	(0.0590)	(0.0498)	(0.0476)	(0.0594)	(0.0732)
Natural resources rents	-0.0334***	0.00282	-0.0377***	-0.0358***	-0.0339***	-0.0308***	-0.0289***
	(0.00445)	(0.00268)	(0.00544)	(0.00461)	(0.00440)	(0.00549)	(0.00674)
Commercial opening	0.00199	0.00170**	-0.000579	0.000543	0.00170	0.00356**	0.00470**
	(0.00133)	(0.000801)	(0.00163)	(0.00138)	(0.00132)	(0.00164)	(0.00203)
Foreign direct investment	-0.00643	-0.01000***	0.00867	0.00207	-0.00474	-0.0157**	-0.0224**
	(0.00605)	(0.00364)	(0.00746)	(0.00627)	(0.00602)	(0.00749)	(0.00928)
Constant	-2.284***	-0.157	-2.047***	-2.151***	-2.258***	-2.430***	-2.535***
	(0.344)	(0.207)	(0.420)	(0.356)	(0.339)	(0.424)	(0.520)
Observations	243	243	243	243	243	243	243

Note: Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Source: Authors.

As reported in Columns 1 and 2, the location and the scale parameters are both positive and statistically significant. The result means that improving financial inclusion increases the average economic complexity (location shift) and the dispersion of economic complexity (scale shift). In addition, the coefficients of financial inclusion reported in Column 3 to 7 are positive and significant. This result implies that financial inclusion increases economic complexity, regardless of the level of economic complexity. Furthermore, the magnitude of the coefficient for financial inclusion increases as ones moves from lower to higher quantiles. Therefore, the positive effect of financial inclusion on economic complexity is lower in countries with low level of economic complexity and higher in those with a high level of economic complexity.

Overall, these results indicate that improving financial inclusion increases economic complexity. These results corroborate the theorical predictions that financial development increases economic complexity (Kletzer and Bardhan, 1987; Baldwin, 1989; Maskus and al., 2012; Hsu et al., 2014; Svirydzenka 2016). In accordance with these theories, financial development can improve economic complexity by promoting access to the credit and resources needed to finance innovative projects and the production of highly sophisticated and diversified products. These results are also in line with several empirical works aux (Chu, 2019; Njangang et al., 2021; Nguyen and Su, 2021; Emeka et al., 2024) that argue that financial inclusion improves economic complexity. On the other hand, these results partially contrast those obtained by Ndoya and al. (2024) who found that financial inclusion has a non-negative but non-significant effect on economic complexity in countries characterized by an average level of financial development and economic complexity.

4.2 Robustness tests

To test the robustness of the basic results, two robustness checks are performed: (i) adding other control variables to the basic model and, (ii) using an alternative dependent variable.

4.2.1. Adding other control variables to the basic model

We test the robustness of our results by adding other variables to the basic model. These variables include: government effectiveness, remittances, and urbanization. We control for the effect of governance quality. In fact, good governance creates an environment conducive to the accumulation of human capital and productive capacities, thereby promoting the production and export of complex products (Chang and Andreoni, 2019; Vu, 2021). In line with Mini et al. (2025), we approximate the quality of governance using the “government effectiveness” indicator of World Bank (2024). This indicator reflects perceptions of the quality of public services, the quality of the civil service, and its independence from political pressures. Furthermore, remittances used for investment purposes can also enable recipient countries to produce and export highly sophisticated and diversified products (Saadi, 2020; Ajide and Osinubi, 2024). Finally, urbanization leads to the concentration of skilled workers and capital and the development of economic activities in urban centers, thereby stimulating innovation and the process of structural transformation (Abbas et al., 2023). Data on these

variables come from the World Development Indicators (World Bank, 2024). The results are presented in Table 5.

Table 5: Robustness test by adding other control variables to the basic model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	location	scale	qtile_10	qtile_25	qtile_50	qtile_75	qtile_90
Financial inclusion	0.00412**	0.000730	0.00304	0.00346*	0.00406**	0.00481*	0.00529*
	(0.00200)	(0.00121)	(0.00239)	(0.00207)	(0.00198)	(0.00250)	(0.00306)
Log (GDP per capita)	0.153*	0.0581	0.0670	0.101	0.148*	0.208**	0.246**
	(0.0807)	(0.0489)	(0.0966)	(0.0834)	(0.0800)	(0.101)	(0.124)
Natural resources rents	-0.0260***	0.00165	-0.0284***	-0.0274***	-0.0261***	-0.0244***	-0.0233***
	(0.00522)	(0.00317)	(0.00625)	(0.00540)	(0.00517)	(0.00653)	(0.00801)
Commercial opening	0.00136	0.00217**	-0.00185	-0.000593	0.00117	0.00339*	0.00483**
	(0.00147)	(0.000889)	(0.00176)	(0.00152)	(0.00146)	(0.00185)	(0.00226)
Foreign direct investment	-0.00713	-0.00966***	0.00722	0.00160	-0.00629	-0.0162**	-0.0226**
	(0.00616)	(0.00373)	(0.00741)	(0.00638)	(0.00615)	(0.00775)	(0.00950)
Government efficiency	0.273**	-0.0202	0.303**	0.292***	0.275***	0.254*	0.241
	(0.106)	(0.0644)	(0.127)	(0.110)	(0.105)	(0.133)	(0.163)
Remittances	0.00949**	-0.00310	0.0141**	0.0123**	0.00976**	0.00659	0.00453
	(0.00480)	(0.00291)	(0.00574)	(0.00496)	(0.00476)	(0.00601)	(0.00736)
Urbanization	0.00121	-0.000336	0.00171	0.00151	0.00124	0.000895	0.000673
	(0.00298)	(0.00181)	(0.00357)	(0.00308)	(0.00295)	(0.00373)	(0.00457)
Constant	-1.664***	-0.202	-1.365**	-1.482***	-1.646***	-1.853***	-1.986**
	(0.530)	(0.321)	(0.634)	(0.548)	(0.525)	(0.663)	(0.813)
Observations	243	243	243	243	243	243	243

Note: Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Source: Authors

Additional control variables including government effectiveness, remittances and urbanization all have a positive effect on economic complexity. The coefficient associated with financial inclusion is positive and significant at 1% in all quantiles (with the exception of the 10% quantile, which is significant at 10%) and increases as one moves from lower to higher quantiles. This result means that financial inclusion favors economic complexity, with a more marked effect in countries characterized by a high level of economic complexity. Thus, the introduction of additional control variables does not affect the results of the basic model.

4.2.2. Using an alternative dependent variable

The second robustness test involved the use of an alternative dependent variable. This variable comes from the Atlas of Economic Complexity published by the Observatory of Economic Complexity, an initiative of the MIT Media Lab and the Harvard Center for International Development. Table 6 presents the results of the effect of financial inclusion on economic complexity using the alternative dependent variable ECI_trade, which captures economic complexity linked solely to trade.

Table 6: Robustness test using an alternative dependent variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	location	scale	qtile_10	qtile_25	qtile_50	qtile_75	qtile_90
Financial inclusion	0.00715***	0.000450	0.00644***	0.00674***	0.00717***	0.00753***	0.00783***
	(0.00176)	(0.00103)	(0.00247)	(0.00205)	(0.00175)	(0.00190)	(0.00226)
Log (GDP per capita)	0.301***	0.0323	0.250***	0.272***	0.302***	0.328***	0.350***
	(0.0442)	(0.0259)	(0.0623)	(0.0515)	(0.0441)	(0.0479)	(0.0571)
Natural resources rents	-0.0260***	0.00277	-0.0304***	-0.0285***	-0.0259***	-0.0237***	-0.0218***
	(0.00405)	(0.00237)	(0.00571)	(0.00472)	(0.00405)	(0.00439)	(0.00523)
Commercial opening	0.000893	0.00122*	-0.00103	-0.000215	0.000939	0.00191	0.00274*
	(0.00121)	(0.000708)	(0.00171)	(0.00141)	(0.00121)	(0.00131)	(0.00157)
Foreign direct investment	-0.00942	-0.00548	-0.000761	-0.00444	-0.00962	-0.0140**	-0.0177**
	(0.00635)	(0.00372)	(0.00896)	(0.00741)	(0.00635)	(0.00689)	(0.00822)
Constant	-2.901***	0.00774	-2.913***	-2.908***	-2.900***	-2.894***	-2.889***
	(0.321)	(0.188)	(0.453)	(0.374)	(0.321)	(0.347)	(0.414)
Observations	234	234	234	234	234	234	234

Note: Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Source: Authors.

Table 6 shows that financial inclusion improves economic complexity at all levels. Moreover, the effect of financial inclusion on economic complexity is low in countries characterized by a low level of economic complexity, and high in those with a high level of economic complexity. Thus, the use of an alternative dependent variable does not alter the results of the basic model.

5. Conclusion

The aim of this research is to explore the effect of financial inclusion on economic complexity in developing countries in a sample of 71 developing countries from 2011 to 2021. The empirical analysis relies on quantile via moments method. To measure economic complexity, we used the economic complexity index developed by Hidalgo and Hausmann (2009). The results show that improving financial inclusion significantly increases economic complexity in developing countries. Moreover, the positive effect of financial inclusion on economic complexity is higher in countries with high level of economic complexity and smaller in those with small level of economic complexity. These results suggest that financial inclusion has a positive and heterogeneous effect on economic complexity in developing countries. This research underscores the need for governments in developing countries to promote financial inclusion to improve the sophistication and diversification of their exportations.

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Appendix:

Table 7: List of the countries un the sample

Algeria Bolivia	Argentina Bosnia and Herzegovina	Armenia Botswana,	Azerbaijan Brazil	Bangladesh Burkina Faso	Belarus Cambodia
Cameroon	China	Colombia	Congo	Costa Rica	Côte d'Ivoire
Democratic Republic of Congo	Ecuador	Egypt	Ethiopia	Gabon	Georgia
Ghana Jamaica	Guinea Jordan	Honduras Kazakhstan	India Kenya	Indonesia Kyrgyz Republic	Iran Lao PDR
Liberia Mexica	Madagascar Moldova	Malawi Mongolia	Mali Mozambique	Mauritania Myanmar	Mauritius Namibia
Nicaragua	Nigeria	North Macedonia	Pakistan	Paraguay	Peru
Philippines Tanzania Ukraine	Senegal Togo Viet Nam	Serbia Tunisia Zambia	South Africa Turkmenistan Zimbabwe	Sri Lanka Türkiye	Tajikistan Uganda

Source: Authors