Does Financial Development Matter for Economic Complexity? –Cross-Country Evidence

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Abstract

Economic complexity represents another way to envision a country's development where productive knowledge is the key to prosperity. This paper examines the role of financial development in promoting economic complexity. Recognizing that financial development promotes economic complexity through various functions, this paper breaks down financial development into its sub-sectors - financial institutions and financial markets, and further into three dimensions (depth, access and efficiency). The findings show that while financial sector development enhances economic complexity, the impacts of financial institutions and financial markets may differ. The full sample results indicate that more financially developed countries have more complex economy structure. Specifically, the depth of financial institution and the efficiency of financial market are crucial in fostering economic complexity. In high-income countries, financial market plays marginal role in promoting economic complexity. Financial institutions depth and efficiency are important in enhancing the complexity of a country's productive structure. In low-income countries, evidence shows that both financial institutions and financial markets spur economic complexity. The depth of financial institutions and financial markets as well as the efficiency of the financial market have significant effects on economic complexity. The findings highlight the importance of examining beyond the overall financial development. By breaking down financial development into its sub-sectors and various dimensions, this study offers insights into

specific areas of financial development that promote economic complexity to facilitate effective policy interventions.

Keywords: Financial Development, Economic Complexity, Financial Institutions, Financial Markets.

Introduction

What exactly is economic complexity? Does financial sector development play a role in facilitating a country's advancement to become a complex economy? Which aspects of the financial system are important in enhancing the complexity of an economy? Economic complexity represents a new approach to envision a country's development where productive capabilities are key for mapping paths to prosperity.[1] The index of economic complexity measures a country's productive knowledge which is also known as capabilities, and it reflects the amount of knowledge that is embedded in the productive structure of an economy (Hidalgo and Hausmann, 2009). Since capabilities are unobservable and cannot be not easily identified, Hidalgo and Hausmann (2009), measure capabilities indirectly by inferring the complexity of a country's productive structure based on the diversity and ubiquity of products that a country produces and exports. Economic complexity is essential for economic growth and for sustaining the momentum of economic progress. Progression to economic complexity involves expanding the amount of productive knowledge in ways that allows a country to increase the number and complexity of the products that they export. We propose that finance plays a fundamental role in this economic progression. We argue that a country's level of financial development determines its opportunities to expand its productive knowledge and increase its level of economic complexity. Theoretical and empirical evidence suggest that financial development influences economic growth by easing market frictions and thereby improving resource allocation, risk distribution and management, information acquisitions, corporate governance, and financial exchanges. Unlocking the link between financial development and economic complexity helps to enhance understanding of the dynamics of economic development. We investigate whether better developed financial sector is associated with more complex economy. As financial functions are aimed at ameliorating market frictions, a well-developed financial sector offers a favorable environment for complexity to thrive. Financial sector development may contribute to promoting a country's productive knowledge by providing important financial services that allow firms to engage in greater diversity of productive activities and also activities that are relatively more complex. So far limited investigation explores the role of finance as the key enabler for economic complexity. We conjecture that the degree of financial development plays important role in influencing the state of productive knowledge as reflected in the economic complexity index. The findings would enable policy makers to sharpen their policy focus on financial sector operations in strengthening a country's productive structure.

Literature Review

The economic complexity concept has been embraced and applied by the World Bank, the Asian Development Bank and others in order to have a better understanding on the challenges that countries face in achieving prosperity – all with the intent of promoting sustainable growth (Escobari, 2013). According to Hidalgo and Hausmann (2009), productive capabilities refer to the combination of inputs, knowledge sophistication, idea, and

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[1] Economic complexity represents a paradigm shift from mainstream economies and is the outcome of years of research at The Growth Lab at Harvard University's Center for International Development (Escobari, 2013).

technologies that determine the frontier of what a country is capable of producing. The productive capabilities measure which they call Economic Complexity Index (ECI) are embedded in the productive structure of an economy. The ECI captures richness in economic development that goes beyond the traditional approach of measuring economic growth. Since capabilities are not observable and cannot be easily identified, Hidalgo and Hausmann (2009), measure capabilities indirectly by inferring the complexity of a country's productive structure based on the diversity and ubiquity of products that a country produces and exports. According to Hidalgo and Hausmann (2009), economic complexity is essential for economic growth and for sustaining the momentum of economic advancement. Progression to complex economy involves expanding the amount of productive knowledge in ways that allows a country to increase the number and complexity of the products that they export. Hausmann et al (2013), find that the relationship between economic complexity and a country's income per capita goes beyond simple correlation. As noted by Hausmann et al. (2013, 27), "... *economic complexity is not just a symptom or an expression of prosperity: it is a driver.*" This suggests that countries that have higher level of economic complexity than their income per capita level are expected to grow faster. Thus, economic growth occurs when countries develop capabilities and productive knowledge to produce diverse and more complex products. This study argues that as countries anchor their growth on capabilities and productive knowledge, financial sector will also need to develop to respond to the changing needs of the economies. A developed financial sector promotes economic complexity as it provides opportunity for a country to expand upon its existing capabilities. Underdeveloped financial sector hampers the structural transformation of a country's economy into complex productive structure, and the longer a country is trapped in an underdeveloped financial system, the slower it can benefit from the evolution of economic complexity. While financial sector is central to any development strategy, limited study has been undertaken to examine the role of finance in influencing economic complexity. Nguyen and Su (2021), find evidence that financial institutions exert larger impacts on economic complexity than financial markets. Njangang et al (2021), show that development in the financial sector promotes economic complexity in Africa. Ndoya et al (2024), finds that financial development positively impacts economic complexity across developing countries, with greater effects in more stable countries and better developed financial sector. As financial functions are aimed at ameliorating market frictions, financial sector development might contribute to making major advances in a country's complexity ecosystem. Theoretical and empirical evidence suggest that financial development influences economic growth by easing market frictions and thereby improving resource allocation, risk distribution and management, information acquisitions, corporate governance, and financial exchanges. Unlocking the link between financial development and economic complexity is therefore critical in fostering sustainable economic progress. This study contributes to the literature by gaining new insights into the role of financial development as a key enabler for economic complexity. The study expands understanding on the process of economic development by going beyond the traditional approach of measuring economic growth and exploring the extent to which financial development is able to stimulate complexity in the productive structure of an economy. The study proposes that finance plays a fundamental role in this economic progression. It is argued that a country's financial development determines its opportunities to expand its productive knowledge and increase its level of economic complexity. Unlocking the link between financial development and economic complexity helps to enhance understanding of the dynamics of economic development. This study investigates whether better developed

and more complex financial sector is associated with more complex economy. As financial functions are aimed at ameliorating market frictions, a well-developed financial sector (both financial institutions and financial markets) offers a favorable environment for complexity to thrive. Financial sector development may contribute to promoting a country's productive knowledge by providing important financial services that allow firms to engage in greater diversity of productive activities and also activities that are relatively more complex. Given that existing investigation on finance-growth nexus is limited to the use of traditional measure of economic growth, this study expands the literature and explores the role of finance as the key enabler for economic complexity. It is conjectured that the degree of financial development and its complexity play important role in influencing the state of productive knowledge as reflected in Economic Complexity Index. The findings would enable policy makers to sharpen their policy focus on financial sector operations to strengthen a country's productive structure and speed up the momentum of economic progress. Hidalgo and Hausmann (2009) view economic development as capabilities accumulation process in which countries accumulate productive knowledge to develop capacity that allow them to increase the diversity and complexity of the products that they make. Said differently, progressing to become a complex economy requires changes in the productive structure which involves productive knowledge accumulation in ways that allow countries to increase the number and complexity of the products in their export baskets. In recent years, studies have validated that economic complexity matters because the level of complexity of a country's economy helps to predict future growth and explain international variations in income levels of countries (Hausmann et al., 2013; Hidalgo and Hausmann, 2009; and Hidalgo et al., 2007). Hartmann et al. (2017) find cross-country evidence that economic complexity is associated not only with income and economic growth but also with income inequality. According Hartmann et al. (2017), a country's productive structure as reflected by its level of economic complexity is in fact a representation of several components ranging from institutional to educational factors that evolves hand in hand with the diversity and ubiquity of products in a country's export basket. That is, the ability of countries to diversify and to produce more complex products very much depends on institutional and educational quality. As argued by the authors, it is for the reason of this co-evolution that they find that a country's level of economic complexity is associated with not only economic growth and income but also with its ability to distribute income equally. Additionally, in Hidalgo and Hausmann (2009, 10570), they emphasize that *"…development efforts should focus on generating the conditions that would allow complexity to emerge to generate sustained growth and prosperity."*

It has been well established in the literature of finance-growth nexus that a developed financial sector is central to achieving sustainable economic growth. The theoretical literature is largely grounded on the ability of the financial sector to resolve various market imperfections that hinders economic growth. Financial sector is proposed, among others, to act as efficient monitoring agent (Diamond, 1984; Ramakrisnan and Thakor, 1984; Boyd and Prescott, 1986); foster corporate governance (Jensen and Meckling, 1976; Jensen and Murphy, 1990); efficiently smoothed risk intertemporally (Allen and Gale, 1997); reduce information acquisition costs, stimulate information production and provide research function (Grossman and Stiglitz, 1980; Merton, 1987; Holmstrom and Tirole, 1993); all of which aid in placing risk to where they are best borne and in channeling the flow of capital to its highest value use. Levine (2005), provides a comprehensive review on the important link between finance and growth. Against this backdrop, this study conjectures that financial

development could potentially play a central role in supporting economic complexity. The current study investigates the relationship between a country's level of financial sector development and its state of economic complexity. We argue that financial development affects a country's level of economic complexity by influencing its ability to accumulate productive knowledge. Innovation and technological advancement are crucial to the expansion of a country's existing capabilities for making larger variety of products of increasing complexity. Financial sector development fosters accumulation of productive knowledge by providing important financial services. Access to external finance can support a country's level of productive knowledge by making investment, technological progress, and skill upgrading possible, all of which are prime drivers of enhancing the complexity of a country's productive structure. This can only happen if financial sector plays a central role in reducing market frictions to allow firms to engage in more diversified and complex productive activities. The idea that finance exerts real effects on the economy is widely established. Theoretical and empirical evidence suggest that financial systems influence economic growth by resolving various market imperfections thereby improving resource allocation, reducing transaction costs, fostering corporate governance, and facilitating screening and monitoring activities (Schumpeter, 1911; Goldsmith; 1969; Beck et al., 2000; Levine, 2005; Jalil et al., 2010; Rahaman, 2011; Kendall, 2012).

The prominent role of economic complexity in predicting nations' economic growth, income levels and in explaining international variations in income inequality calls for the investigation of the determinants of economic complexity for guiding policy formulation accordingly. That is, given the rising importance of economic complexity in mapping the growth potentials of countries, policies and strategies should focus on creating an ecosystem that enhances and strengthens nations' productive structure to speed up the momentum of economic progress. We argue that financial development may contribute to enhancing a country's productive structure in ways that allow economic complexity to thrive by facilitating capabilities accumulation. Numerous studies have shown that financial development confers advantages to industries and firms that are dependent on external finance and have substantial amount of intangible assets, for examples technology-and R&D-intensive sectors, and industries with highly skilled workforce (Carlin and Mayer, 2003; Mayer, 2002; Rajan and Zingales, 1998; 2001, Maskus et al., 2012). Pang and Wu (2009), finds that countries with better developed financial market invest more in growing industries and this pattern is more prominent for industries that are more dependent on external finance. Collectively, these studies suggest that industries that rely heavily on external financing perform better if they operate in countries with well-developed financial sector (banks and stock markets) as compared to industries that use little external finance. Generally, firms or industries that engage in innovative and technological related activities are essentially heavy users of external finance and have many of their productive assets that are intangible in nature. Such investments are typically risky with high degree of uncertainty and financial development, by enabling these assets to be financed and risk to be diversified, acts as an important growth catalyst for improving a country's productive capabilities. King and Levine (1993), Morales (2003), Acemoglu et al. (2006) and among others provide evidence that financial intermediaries promote technological innovation by allocating resources to entrepreneurs with the most promising new opportunities such as new products, production methods, and new markets that have the highest possible success rate. Ang (2010, 2011) finds that financial deepening facilitates ideas production and the accumulation of knowledge. Studies have also

shown that frictions in the capital market constrain firms' growth and contribute to differences in the adoption and speed of diffusion of new technologies (Hyytinen and Toivanen, 2005; Comin and Nanda, 2009; and Correa et al., 2009). Tee et al (2014), find that better developed banking sector is associated with higher number of patent applications in seven East Asian countries over the period from 1998-2009. Barbosa and Faria (2011), find that more developed credit markets foster innovation in the manufacturing industry of ten European countries. Low et al. (2018), find that countries with more developed stock markets have relatively higher efficiency in transforming innovation input into innovation output than those with less developed stock markets. Low et al (2015), show that for a sample of emerging countries, larger financial sectors and bank-based financial systems are associated with higher knowledge-based economy ranking. More recently, numerous studies have also shown that innovation is crucial for economic complexity because innovation enhances production quality and the diversity of goods for exports (Ma et al., 2022; Arif, 2021; and Atasoy, 2021). A well-developed financial sector fosters innovation through the provision of financial services and efficient resource allocations to the most strategic and promising oppurtinities, allowing technology to spur growth Zhu et al (2020), Collectively, these studies on financial sector development provide supportive view that finance potentially has important role in allowing economy complexity to emerge. That is, financial development could potentially be the key to enhancing the complexity of a country's productive structure and thus speed up the process of economic development. The findings on the link between financial development and economic complexity allow for the formulation and implementation of relevant financial sector policies that can help countries fulfil their growth potentials and thus enable their citizens to prosper and enjoy a better quality of life. For academics, the findings expand existing literature on finance-growth nexus, enhance understanding on the working of economic complexity that highlights the important role of finance and provide a basis for future research focusing on specific country-level analyses.

Data and Methodology

We employed the IMF Financial Development Index Database which provide indices of financial development developed based on the IMF Staff Discussion Note "Rethinking Financial Deepening: Stability and Growth in Emerging Markets" (Sahay et al., 2015). Financial development is broadly defined based on multi-dimensional approach that follows a 4x2 matrix of financial system characteristics developed by (Čihák et al., 2012). The overall index of financial development (FD) can be categorized into financial institutions (FI) and financial markets (FM) indices. Financial institutions comprise both banks and nonbanks institutions such as banks, insurance companies, mutual funds, and pensions. Financial markets encompass stock and bond markets. The sub-indices of FI and FM summarize the degree of development for financial institutions and markets in terms of depth (size and liquidity), access (the extent to which individual and firms have access to financial services), and efficiency (ability of financial institutions and markets to provide services at low cost). We investigate the relationship between financial development and economic complexity index (ECI) using the Generalized Method of Moments (GMM) estimator proposed by Arellano and Bond (1991), which utilizes the orthogonality conditions that exist between lagged values of $Y_{i,t}$ and the disturbances $u_{i,t}$ (Law, 2009). GMM panel estimator offers better control for endogeneity of all the explanatory variables by accounting for unobserved individual specific effects, exploiting the variations in the time series data, and allowing for the inclusion of lagged dependent variable as repressor (Beck et al. 2000). Furthermore, this method is

chosen for its ability in providing more degrees of freedom, as it contains cross sectional and time series data, and solves the omitted variables problem (Hsiao et al. 1995, Ng et al. 2020). There exist two major types of the GMM estimator: the Arellano – Bond (difference GMM) approach and its extension to the 'System GMM' (SGMM) context. Bond (2002) suggested if the coefficient lagged first-differences of the dependent variable in System GMM is higher than of the difference GMM, then accept the results of the former method as the later creates a downward bias on the results. Furthermore, the study implements the second System GMM step to obtain a consistent Hansen statistic and second order autocorrelated disturbances than the first step (Roodman, 2009b). Finally, the two-step estimator as it is more efficient relative to the first-step estimator results (Law, 2009).

The GMM estimator is based upon the following orthogonality conditions: $E\left(ECI_{i,t-s}\Delta u_{i,t}\right) = 0$ for $t = 3, \dots, T$ and $2 \leq s \leq T - 1$, where $ECI_{i,t-s}$ are suitable lags of the dependent variable. In essence, the second and further lags of the dependent variable are used as instruments in Equation (1) and (2). As suggested by Roodman (2009), the number of instruments should be ideally less than the number of cross-sectional units, which is the number of countries in this context. To deal with this problem, this paper collapses the instrument set and uses specific lags as instruments, following Roodman (2009).

The sample covers 107 developed and developing countries over the period of 1998–2017, of which 70 and 37 are high-income (consists of high income and Upper middle income) and low-income (consists of lower middle income and low income) countries, respectively, based on the World Bank's classification. This categorization is used to further investigate the study relationship by dividing the study sample into two subgroups, which are high-income countries and low-income countries.

The specification of our model is described by the following equation:
$$ECI_{i,t} = Const. + \alpha ECI_{i,t-1} + \beta_1 FD_{i,t} + \beta_k Controls_{i,t} + \delta_t + u_{i,t} \qquad (1)$$

The dependent variable is the economic complexity index of country i in period t $(ECI_{i,t})$ to proxy for a country's overall state of economic complexity. The effect of independent variable, financial development $(FD_{i,t})$ is measured by β_1. The lagged dependent variable on the right-hand side is included to capture the dynamic characteristics of the ECI (Sweet and Maggio, 2015; Vu, 2019). In addition, δ_t's donates time-specific effect, which capture common shocks to the dependent variable level of all countries. Finally, $u_{i,t}$ represents the error term, with $E\left(u_{i,t}\right) = 0$ for all i and t. Financial development is multifaceted, and examining its sub-dimensions provides insights into how financial institutions and financial markets promote a country's economic complexity. The development of financial institutions and financial market are essential for fostering economic complexity. Therefore, we in the second equation, we examine the impact of financial institution and financial market development in explaining the economic complexity of a country. The second equation:

$$ECI_{i,t} = Const. + \alpha ECI_{i,t-1} + \beta_1 Fi_{i,t} + \beta_2 Fm_{i,t} + \beta_k Controls_{i,t} + \delta_t + u_{i,t} \qquad (2)$$

Additionally, the present study takes a further step in investigating the sub-dimensions of both financial institutions and financial market (depth, access, and efficiency) in explaining

the economic complexity of a country. The following third and fourth equations show the impacts of the sub-dimensions of financial institutions and financial market, respectively:

$$ECI_{i,t} = Const. + \alpha ECI_{i,t-1} + \beta_1 FiD_{i,t} + \beta_2 FiA_{i,t} + \beta_3 FiE_{i,t} + \beta_k Controls_{i,t} + \delta_t + u_{i,t} \tag{3}$$

$$ECI_{i,t} = Const. + \alpha ECI_{i,t-1} + \beta_1 FmD_{i,t} + \beta_2 FmA_{i,t} + \beta_3 FmE_{i,t} + \beta_k Controls_{i,t} + \delta_t + u_{i,t} \tag{4}$$

To ensure a robust econometric identification, we also include several variables to control for factors that can explain the cross-country variation in the levels of economic complexity. As noted by Hausmann et al. (2013), more complex economies tend to have more well educated workforce and competitive environment. The variable initial real GDP per capita controls for convergence effect. We used average years of schooling to measure education level, population density to measure geographic potential of a country and the size of the labor force. The variable FDI captures a country's foreign direct investment. The ratio of general government final consumption expenditure to GDP was employed to measure a country's fiscal policy stance. Higher education level and population density are deemed to benefit a country's knowledge accumulation, hence fostering economic complexity. All control variables are transformed into logarithms.

Results and Discussions
Table 1 presents descriptive statistics of variables used in the study. The overall economic complexity value has a small positive mean value of 0.090 with a wide spread as indicated by a standard deviation of 0.983. The range of value extends from -2.424 to 2.377, indicating large variability which is not surprising since the sample include high-income and low-income countries. On average, the overall financial development is 0.352 with a standard deviation of 0.230 indicating a moderate level of variability. On sub-indices of financial development, the average values of financial institutions and financial markets are 0.434 and 0.263 respectively. The higher mean value for financial institutions suggests that most of the sampled countries have bank-based financial system.

Table 1
Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	Observations
Economic Complexity Index (ECI)	0.090	0.983	-2.424	2.377	N = 2174
Financial Institution (FI)	0.434	0.219	0.019	1.000	N = 2180
Financial Market (FM)	0.263	0.265	0.000	1.000	N = 2180
Financial Institution Depth (FID)	0.273	.259	0.000	1.000	N=25707
Financial Institution Access (FIA)	0.337	0.274	0.000	1.000	N=25707
Financial Institution Efficiency (FIE)	0.631	0.166	0.000	0.935	N=25707
Financial Marker Depth (FMD)	0.2433	0.276	0.000	1.000	N=25707
Financial Market Access (FMA)	0.248	0.283	0.000	1.000	N=25707
Financial Market Efficiency (FME)	0.270	0.339	0.000	1.000	N=25707
Gross Domestic Product (GDP)	19243.070	18280.950	587.780	104091.000	N = 2175
Gov	15.908	4.932	0.952	31.581	N = 2130
Pop	120.928	191.884	1.516	1920.400	N = 2178
Edu	82.722	28.774	5.291	163.935	N = 1808
FDI	5.150	13.046	-37.155	280.132	N = 2175

Table 2 reports findings for the full sample. The results of model 1 shows that the overall level of financial development is positively associated with economic complexity. Financial development refers to development in financial institutions and financial markets of the financial sector. The level of financial development reflects a country's ability in overcoming frictions or imperfections of the financial system. Economic complexity is characterized by complex production capacity involving high level of asymmetric information, failure rate and thus often face severe funding constraints. Well-developed financial institutions and financial markets are able to reduce market frictions by performing various functions all of which facilitate the financing of complex activities and thus promote economic complexity. Our findings are broadly in line with the findings of Hsu et al. (2014), Ho et al. (2018), Law et al. (2018) that financial development promotes innovative activities. Model 2 reports the results when the overall financial development is separated into financial institutions and financial markets. The findings indicate that financial institutions play key role for economic complexity to flourish whereas the positive effects of financial markets are only marginally significant. This suggests that financial institutions play a more significant role than financial markets in ameliorating market frictions, hence facilitating technological advancements and innovation, and contributing to productive knowledge accumulation that promote a country's economic

complexity. The difference in the effects of financial institutions and financial markets on economic complexity highlights the substantive roles of financial institution in fostering innovative related activities, which have been widely researched. Models 3 and 4 report results for the three dimensions of financial sector development (depth, access and efficiency) for both financial institutions and financial markets respectively. Specifically, the findings suggest that the depth of financial institutions and the efficiency of financial markets positively impact the complexity of a country's economic structure. In sum, the results for the overall sample support the importance of financial sector development in influencing a country's economic complexity. In all the models from 1 through 4, previous year's economic complexity level plays significant positive role in influencing the current economic complexity.

Table 2
Results for Full Sample Countries

VARIABLES	Model 1	Model 2	Model 3	Model 4
$ECI_{i,t-1}$	0.803***	0.801***	0.811***	0.820***
	(0.0234)	(0.0255)	(0.0280)	(0.0218)
Financial Development	0.209***			
	(0.0675)			
Financial Institutions (FI)		0.159**		
		(0.0800)		
Financial Market (FM)		0.0738*		
		(0.0424)		
FI Depth			0.115**	
			(0.0543)	
FI Access			0.0537	
			(0.0438)	
FI Efficiency			0.0348	
			(0.0390)	
FM Depth				0.0451
				(0.0351)
FM Access				-0.0179
				(0.0354)
FM Efficiency				0.0642***
				(0.0222)
Gross Domestic Product	0.156***	0.148***	0.154***	0.197***
	(0.0353)	(0.0374)	(0.0361)	(0.0308)
Gov	0.00312**	0.00269**	0.00239*	0.00304***
	(0.00128)	(0.00133)	(0.00129)	(0.00111)
Population	0.0360***	0.0371***	0.0381***	0.0339***
	(0.00733)	(0.00747)	(0.00792)	(0.00693)
Edu	0.0802**	0.0821**	0.0660	0.0458
	(0.0387)	(0.0410)	(0.0411)	(0.0350)
FDI	-0.000285*	-0.000297**	-0.000325**	-0.000226
	(0.000147)	(0.000146)	(0.000134)	(0.000143)
Constant	-1.043***	-1.026***	-1.008***	-1.083***

	(0.143)	(0.144)	(0.149)	(0.139)
Observations	1,760	1,760	1,760	1,760
Number of id	109	109	109	109
Instruments	56	57	58	58
AR(2)	0.416	0.410	0.406	0.418
Hansen p-value	0.468	0.451	0.430	0.439

All regressions include year dummies. AR(2) is the p-values for second order autocorrelated disturbances. ∗∗∗, ∗∗, and ∗ indicate significance at the 1%, 5%, and 10% levels respectively. Hansen p-value indicates that our instruments are valid and not correlated with the residual by accepting the null hypothesis. The value in parentheses is the standard errors.

Table 3
Results for High-Income Countries

VARIABLES	Model 1	Model 2	Model 3	Model 4
$ECI_{i,t-1}$	0.803***	0.676***	0.706***	0.474***
	(0.0234)	(0.0402)	(0.0316)	(0.0552)
Financial Development	0.209***			
	(0.0675)			
Financial Institutions (FI)		0.332*		
		(0.172)		
Financial Market (FM)		0.0819		
		(0.0534)		
FI Depth			0.190**	
			(0.0911)	
FI Access			0.0820	
			(0.0826)	
FI Efficiency			0.0821	
			(0.0752)	
FM Depth				-0.0749
				(0.0996)
FM Access				0.154*
				(0.0803)
FM Efficiency				0.230***
				(0.0688)
Gross Domestic Product	-0.0179	0.0471	0.0454	0.207
	(0.136)	(0.117)	(0.0930)	(0.147)
Gov	0.00643*	0.00657**	0.00533**	0.00432
	(0.00344)	(0.00255)	(0.00231)	(0.00583)
Population	0.0787***	0.0675***	0.0629***	0.101***
	(0.0169)	(0.0143)	(0.0113)	(0.0219)
Edu	0.191	0.0230	-0.0224	0.570*
	(0.184)	(0.159)	(0.148)	(0.300)
FDI	-0.000378*	-0.000398**	-0.000455***	-0.000235
	(0.000187)	(0.000167)	(0.000141)	(0.000326)

Constant	-0.652	-0.609	-0.446	-2.231***
	(0.517)	(0.444)	(0.433)	(0.590)
Observations	716	716	716	716
Number of id	39	39	39	39
Instruments	35	36	37	37
AR(2)	0.312	0.275	0.274	0.468
Hansen p-value	0.182	0.256	0.346	0.143

All regressions include year dummies. AR(2) is the p-values for second order autocorrelated disturbances. ***, **, and * indicate significance at the 1%, 5%, and 10% levels respectively. Hansen p-value indicates that our instruments are valid and not correlated with the residual by accepting the null hypothesis. The value in parentheses is the standard errors.

Table 3 shows the results for high-income countries (high and upper middle income). Similar to the findings of full sample, the results in model 1 indicate that a country's overall financial development is positively and highly significantly related economic complexity. In model 2, when overall financial development is segregated into two sectors (financial institutions and financial markets), only financial institutions show a positive impact on economic complexity, although with weak significant level. The development of financial institutions and market comprise dimensions such as depth, access and efficiency. Models 3 and 4 report these sub-dimensions result of financial institutions and financial markets respectively. In model 3, the depth of financial institutions significantly and positively influences economic complexity or the sophistication of a country's economic activities. This dimension captures the segment of financial institutions relative to the economy, reflecting the bank-based nature of a country's financial system. For financial market, the results in model 4 indicate that the efficiency dimension significantly and positively contributes to economic complexity or the accumulation of a country's productive knowledge. Table 4 present the findings for low-income countries (lower-middle and low-income). The descriptions for models 1 to 4 are the same as in tables 3 and 4. As before, the findings indicate that the overall development of financial sector exerts a highly significant influence on economic complexity in these countries. In model 2, when the overall financial development is divided into its sub-sectors, both financial institutions and the financial markets sectors have significant and positive impacts on economic complexity. This suggests that both types of financial sectors are important in driving economic complexity for lower-middle and low-income countries. In terms of sub-dimensions, consistent with the findings for high-income and upper-middle income countries, the depth of financial institutions and financial markets are positively associated with economic complexity. Additionally, the results also indicate that the efficiency dimension of the financial market plays key role in promoting economic complexity.

Table 4
Lower-Income Countries

VARIABLES	Model 1	Model 2	Model 3	Model 4
$\text{ECI}_{i,t-1}$	0.766***	0.752***	0.774***	0.616***
	(0.0337)	(0.0403)	(0.0454)	(0.0954)
Financial Development	0.486***			
	(0.0839)			
Financial Institutions (FI)		0.156**		
		(0.0665)		
Financial Market (FM)		0.305***		
		(0.0809)		
FI Depth			0.243***	
			(0.0631)	
FI Access			-0.0745	
			(0.128)	
FI Efficiency			0.0577	
			(0.0698)	
FM Depth				0.442***
				(0.0923)
FM Access				-0.100*
				(0.0549)
FM Efficiency				0.157**
				(0.0682)
Gross Domestic Product	0.130	0.129	0.313	0.352***
	(0.0966)	(0.0877)	(0.233)	(0.110)
Ggov	0.00158	0.00311*	0.00418**	0.00375**
	(0.00161)	(0.00158)	(0.00179)	(0.00146)
Population	0.0417***	0.0429***	0.0563***	0.0580***
	(0.00993)	(0.0111)	(0.0179)	(0.0165)
Edu	0.0607	0.0636	0.0524	0.135
	(0.0666)	(0.0625)	(0.153)	(0.0944)
FDI	0.00272*	0.00261	0.00152	0.00252*
	(0.00155)	(0.00185)	(0.00184)	(0.00140)
Constant	-0.987***	-0.995***	-1.715	-2.053***
	(0.337)	(0.318)	(1.192)	(0.502)
Observations	497	497	497	497
Number of id	31	31	31	31
Instruments	31	32	33	33
AR(2)	0.310	0.302	0.299	0.283
Hansen p-value	0.448	0.382	0.587	0.736

All regressions include year dummies. AR(2) is the p-values for second order autocorrelated disturbances. ***, **, and * indicate significance at the 1%, 5%, and 10% levels respectively. Hansen p-value indicates that our instruments are valid and not correlated with the residual by accepting the null hypothesis. The value in parentheses is the standard errors.

Conclusion

Countries with more developed financial sectors are more capable of diversifying their economies in response to new opportunity, emergence of novel idea and technologically breakthrough, hence are more able to produce highly sophisticated products. However, the relationship between financial development and economic complexity remains under-explored. This study examines the relationship between financial development and economic complexity. This study conjectures that more financially developed economies have higher tendency to be economically complex. Recognizing that the development of financial institutions and financial market are multidimensional, this study further examines their sub-dimensions—depth, efficiency, and access, hence offering insights into the specific aspects of financial development that foster and strengthen a nation's productive economic structure. The findings indicate that financial sector development does matter for economic complexity. The depth of financial institutions and the efficiency of the financial markets are crucial in fostering economic complexity in high income countries. In addition to financial institutions depth, financial markets depth and efficiency also contribute positively to enhancing economic complexity in low income countries. The findings on the link between financial development and economic complexity allow for the formulation and implementation of relevant financial sector policies that can help countries fulfil their growth potentials and thus enable their citizens to prosper and enjoy a better quality of life. For academics, the findings expand existing literature on finance-growth nexus, enhance understanding on the working of economic complexity that highlights the important role of finance and provide a basis for future research focusing on specific country-level analyses. Since financial development is multifaceted, by segregating the sub-sectors of financial development into its sub-dimensions (depth, efficiency and access), this study provides insights into the specific areas of financial development that are conducive for economic complexity to flourish. This is useful to guide policymakers in creating policy reforms related to financial sector conditions that foster and strengthen a nation's productive structure.

Theoretical and Contextual Contribution

In recent years, the topic on economic complexity has gained popularity among academics and practitioners alike, who view economic complexity as a new driver of a country's development. A country's progression to economic complexity involves expanding the amount of its productive knowledge in order to increase the number and complexity of the products that it exports. Theoretical and empirical evidence in the literature of finance-growth nexus have established that a developed finance sector is central to achieving economic growth. However, research linking financial development and economic complexity has not been fully explored. We argue that a country's level of financial development determines its opportunities to expand its productive knowledge and increase its level of economic complexity. The novelty of this study is in the use of financial development indexes instead of the conventional financial development indicators in examining the relationship between financial development and economic complexity. This study contributes to the literature by shedding light on the role of finance as the key enabler for economic complexity. Unlocking the link between financial development and economic complexity enhances understanding of the dynamics of economic development. The findings aid policymakers in designing specific financial sector policies that enhances a country's productive structure to foster economic complexity.

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