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Financial Deepening and Shadow Economy Transformation in Belt and Road Economies: Pathways to Inclusive Growth

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ABSTRACT: The purpose of this paper is to examine the direction of the connection between financial deepening (FD) and shadow economy in Belt and Road Initiative economies (BRI). The financial deepening is captured via the comprehensive financial development index based on the depth, access, and efficiency of financial institutions. Whereas, the shadow economy is measured via the informal economy. The finding reveals the strong negative impact of inclusive financial development on the shadow economy in BRI countries. The results are consistent across the alternative proxies of financial deepening. These outcomes enrich modernization and inclusion theories and offer recommendations for legislatures who wish to advance the formal structured economic action and decrease informal employment, tax evasion, and unauthorized businesses in BRI countries.

KEYWORDS: Financial Deepening, Shadow Economy, BRI Countries

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Introduction

The Belt and Road Initiative (BRI), launched in 2013, is an ambitious economic development strategy that has brought together, primarily in Asia, Africa, and Europe. As BRI countries continue to integrate into the global economy, issues such as financial development and the shadow economy become increasingly relevant. Financial development, encompassing access to credit, banking services, and capital markets, is crucial for promoting economic growth and stability. However, the intensification of the shadow economy, which includes legal economic activities unrelated to the legal regime of the official, is widespread in parallel to the more organized institutionalized financial organizations. This study investigates the direction of this hypothesis is the interaction between financial development (Independent Variable, IV) and the size of the shadow economy what they have called the 'Real Economy' or the 'Gross Domestic Product' (GDP) or more appropriately, the 'Gross Domestic Economy' (GDE) or the 'Nominal Economy' (NE) or the 'Economic Instrument' (EI) (Dependent Variable, DV) in the BRI countries.

The issue discussed in this research stems from the relatively under-researched relationship between a discussion on financial development and the shadow economy in the framework of BRI countries. While

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financial development is intellectually conceived mainly in terms of the growth of the formal economic system, the shadow economy—is Nau. including the underground economy, corruption, as represented by tax avoidance, and unreported enterprise, tends to blossom in conditions where the financial networks are traditional or corrupt. In many BRI countries, the prospects of financial liberation, and the barriers to entry to the highly structured banking network Andean excessive regulation generate problems of the shadow economy. Understanding this status represents an ideal relationship that policymakers should pursue for the development of sustainable economic growth. While at the same time restricting the informal economy sectors.

However, according to Haffoudhi and Guizani's (2023) study in the MENA countries, corruption and FD act it is as substitutes, where low corruption as a variable amplifies or boosts the role of FD in the reduction of SE. Ajide (2021) highlights the role of, or the need for, Fint Ing in Africa, this is then in tandem with Imamoglu (2021) who posits that. Indeed, this paper shows that while trade openness and FD do effectively mitigate the 'underground economy' in European Union countries. progressing the strategy of Europe 2020. These advancements and challenges remain in leveraging FD to address SE. Elsherif (2019) highlights that without careful policy management, financial inclusion may inadvertently increase financial instability in emerging markets. Similarly, Meleshko, Prokopenko, and Gudz (2021) in Ukraine link SE growth to weakened financial security, suggesting that robust governance frameworks are essential for FD to achieve its intended effects. Theories of financial development and the shadow economy suggest that financial services could either support the formalization of informal economic activities or facilitate the growth of the shadow economy, depending on the regulatory environment and the level of financial inclusion.

The relationship between the shadow economy (the dependent variable) and financial development (the independent variable) has been the subject of conflicting empirical studies. In order to address endogeneity, heteroscedasticity, and cross-sectional dependence, we applied econometric approaches to panel data. For example, the growth of peer-to-peer lending and mobile banking in BRI nations may make it easier for unregulated companies to prosper, particularly in areas with lax financial regulation. By examining the precise impact of financial development on the shadow economy in the BRI countries, this study will attempt to close the gap in the empirical literature on these countries.

This study adds to the body of literature by offering a thorough examination of the relationship between financial development and the shadow economy in BRI nations. The shadow economy of participating nations is impacted by the Belt and Road Initiative (BRI). Few studies specifically focus on BRI countries, despite the fact that some have examined the connection between financial development and the shadow economy. The Belt and Road Initiative, which includes more than 19 nations. Policymakers, financial institutions, and foreign organizations seeking to lessen the shadow economy and advance financial development in the framework of the Belt and Road Initiative will find great value in the findings. By looking at a wide range of nations with differing degrees of financial growth and shadow economy activity, this study also offers empirical value.

This study will offer important theoretical, empirical, and policy-related contributions, as well as fresh perspectives on the connection between financial development and the shadow economy in BRI nations. In the context of a constantly shifting global economic climate, concentrating on this understudied sector will

provide a thorough grasp of how financial development can assist formal economic growth while tackling the issues of informality and the shadow economy.

Literature Review

The impact of FD on the size of the SE will also be examined in this research. Three factors will be used to analyze FD: depth, accessibility, and market and financial institution efficiency. The de-trended panel dataset used in this study includes 114 nations for the years 2002–2015, further classified as low and lower-middle-income economies (LMEs), upper-middle-income economies (UMEs), and high-income economies (HIEs). Various econometric methodologies were employed, including panel data estimation methods. According to the computed indices, financial institutions play a significant role in lowering the rate of the shadow economy, particularly by increasing the effectiveness of the institutions in question. According to the findings, there is a U-shaped relationship between FD and SE. Improved FD and access to these funds in the beginning always result in increased SE, but with time, access to financial institutions reduces SE, especially in wealthy, high-income economies.

Abuamsha and Hattab (2024) utilize the multi-indicator multi-cause (MIMIC) methodology to examine the correlation between Palestine's financial progress and the shadow economy from 1998 to 2021. This study explores the adverse relationship between the shadow economy and financial sustainability. This paper analyzes the interaction between the shadow economy and financial development in Jordan through a nonlinear paradigm, as presented by Abu-Lila (2021). This study utilizes data from 1990 to 2019 and uses the Johansen cointegration test as its statistical method. Empirical data demonstrates a long-term inverted U-shaped correlation between financial development and the shadow economy.

Using data envelopment analysis from 2005 to 2015, Ajide (2021) investigates the impact of financial inclusion on the shadow economy in thirteen African countries. To substantiate the assertion that financial inclusion and the Shadow Economy are inversely correlated, the paper utilizes direct cross-sectional and longitudinal data quantitative estimation techniques. Furthermore, Ajide (2021) analyzes data from thirty (30) African nations from 2000 to 2017 to investigate the impact of the shadow economy on sustainable development in Africa. Current panel quantile regression research indicates that the shadow economy is undermining sustainable development.

Berdiev (2016) employed a panel data set comprising 161 nations from 1960 to 2009, incorporating aspects of both cointegration related to financial development and cointegration concerning the shadow economy. The authors refute the idea that financial development and the shadow economy lack adverse impacts by employing the panel vector autoregression (VAR) model. Likewise, Capasso and Jappelli (2013) investigate the impact of financial development on the size of small and medium-sized enterprises (SMSEs). This study employed an econometric model to evaluate the inverse relationship between the magnitude of the informal economy and the extent of financial liberalization, utilizing data from Italy and analyzing regional disparities from 1989 to 2006.

Dada et al. (2023) analyzed data from thirty African nations from 1991 to 2017 to investigate the correlation between the shadow economy, financial development, and environmental sustainability in Africa. Daily analysis with an AMG estimator clearly indicates that the shadow economy's magnitude, financial

development, and environmental impacts are all detrimental. Furthermore, Din, Habibullah, and Hamid (2019) reassess the magnitude of Malaysia's shadow economy and examine the moderating influence of financial development. Consequently, the analytical instrument, a cash-deposit ratio methodology, uses data from 1970 to 2013 to demonstrate the nonlinear relationship between financial development and the shadow economy to substantiate this.

Furthermore, employing the panel fixed effect and 2SLS model, and utilizing data from 20 countries between 2004 and 2014, (Elsherif, 2019) investigated the impact of financial inclusion and the shadow economy on the financial stability of emerging economies, revealing a positive association between the two variables. In a similar vein, Haffoudhi & Guizani (2023) analyze the impact of financial development on the shadow economy across 20 MENA countries, utilizing sample data from 1996 to 2018. The study uses pooled regression analysis and shows that there is a negative correlation between financial development and the shadow economy.

Furthermore, (Gharleghi & Jahanshahi, 2020) investigates the threshold effect in relation to the shadow economy and financial development in 29 developed and developing nations from 1975 to 2015. This study establishes cross-country evidence of a negative association between financial development and the shadow economy using the panel threshold model. Additionally, (Hajilee, Stringer, & Metghalchi, 2017) examined the financial market impacts of the shadow economy for a group of 18 chosen emerging economies between 1980 and 2013. This study demonstrates that there is a positive correlation between the degree of financial access and the shadow economy since the NARDL model allows for the estimate of a vector with the identification of asymmetric effects.

Similarly, Haruna (2023) discusses the various ways that financial development has contributed to the black market in 42 African nations between 1990 and 2018. To verify that there is a negative correlation between financial development and the shadow economy, OLS with cross-section fixed effect and system GMM are used. The association between trade openness and financial development was also established by Imamoglu (2021), who used both variables to analyze the impact of each on the abstract economy of EU member states between 2004 and 2017. Additionally, by employing the panel data analysis method, this study demonstrates that trade openness and financial growth do, in fact, have extremely strong effects on the extent of the underground economy. Thus, the findings indicate that improving trade regulation and strengthening the stability of financial institutions can aid in lowering the informal economy's share in the 2020 European strategy targets.

The impact of the FMI and the shadow economy on the economic growth of LDCs is also examined by (Ishioro, 2020). However, the study discovers that financial access has a positive correlation with development or the shadow economy by estimating panel data for the chosen country from 1995 to 2018. Furthermore, Khan and Senhadji (2003) studied cross-sectional data from 1960 to 1999 on financial development and economic growth. Finally, it is concluded that financial development contributes to economic growth through the use of cross-country regression methodologies.

Similarly, (LUONG, NGUYEN, & NGUYEN, 2020) investigated the connection between the two indicators of economic growth, the shadow economy, and the rule of law in 18 transition economies between 2002 and 2015. The Generalized Method of Moments (GMM) and cross-sectional data are used in this study to examine

the findings and validate the notion that the shadow economy and economic growth are negatively correlated. Similarly, (Meleshko, Prokopenko, & Gudz, 2021) focuses on analyzing how shadow economy trends have affected Ukraine's financial security over the past few years. The study demonstrates that there is a negative relationship between financial security and the shadow economy by using regression and multiple correlation analysis.

Additionally, (Onwuka & Ayeni, 2023) looks at how financial development affected the shadow economy in 41 African nations between 1991 and 2018a. The effectiveness of financial institutions has the largest deterrent effect, and this study actually uses a panel quantile regression to reveal that financial development discourages the shadow economy. These findings show that more access, depth, and effectiveness of financial advertisement information sources must be achieved, which has important ramifications for future research.

Hypotheses

H1: Financial development has a negative impact on the shadow economy.

Literature Gap

The two variables of the study, shadow economy and financial development have been investigated independently in numerous previous studies, however the research on the nexus between them particularly in the BRI countries are still scarce. While seeking to assess the implications of the Belt and Road Initiative (BRI) in economic, the political, and infrastructural domains, one can point to a relative shortage of studies.

Data and Research Methodology

Data Collection and Sample Detail

This study uses a quantitative research methodology, relying on statistical analysis and numerical data to investigate the connection between financial development and the shadow economy in BRI nations. By analyzing unobserved heterogeneity, panel data, which is used in conjunction with cross-sectional and time-series data, improves the study's robustness and allows for a more in-depth understanding of the dynamics at play in the BRI countries. Austria, Bangladesh, Brazil, China, Egypt, Ethiopia, Russia, Algeria, Barbados, Benin, Burundi, Djibouti, Ecuador, Guinea, India, Italy, Saudi Arabia, South Africa, Thailand, and Cambodia are among the BRI nations that are the subject of this study. The chosen nations represent a range of financial development and shadow economy circumstances, making them a perfect sample to examine how financial development affects the shadow economy.

Financial Econometrics Model

$$Shadow\ Economy = \beta_{0i} + \beta_{1i} * Financial\ Development_i + \beta_{2i} * Internet_i + \beta_{3i} * Trade_i + \beta_{4i} * FDI\ net\ inflow_i + \beta_{5i} * Unemployement_i$$

Estimation Techniques

The study's data is sourced from the IMF and WDI to analyze the impact of the shadow economy on financial development. Nguyen and Duong (2024) as well as Medina and Schneider (2019) are utilized to assess the

shadow economy. Financial development pertains to the depth and efficacy of financial institutions and markets, as measured by the International Monetary Fund's (IMF) indices for financial institutions depth, financial institutions access, financial institutions efficiency, financial markets depth, financial markets access, and financial markets efficiency. Using data from the World Database Index (WDI), an attempt is made to examine the substantial correlation between the control variables—population growth, inflation, labor force participation, and income level—and the shadow economy. With the use of population measures, the following factors are related to the shadow economy: internet (annual percentage), inflation, GDP deflator (annual percentage), income level (constant US dollars), and foreign direct investment (percentage of GDP). The data used in this study is analyzed using econometric methodologies.

Table 1

Variable Definitions and Sources

variables	Definition	Source
Shadow economy	This is the proportion of informal businesses in relation to GDP, which comprises those businesses which are not controlled by laws enacted by the government.	Medina and Schneider (2018)
Financial development	This depicts the level of achievement in financial institutions and markets measured by financial openness, accessibility, and effectiveness	FD-IMF
FI	Financial institutions Index	FD-IMF
FM	Financial market index	FD-IMF
FID	financial institutions' depth index	FD-IMF
FIA	Financial institutions access index	FD-IMF
FIE	Financial Institutions Efficiency index	FD-IMF
FMD	Financial market depth index	FD-IMF
FMA	Financial market access index	FD-IMF
FME	Financial market efficiency index	FD-IMF
UNEM	Unemployment	WDIs
INTERNET	Internet usage	WDIs
TRADE	Trade openness	WDIs
FDI	FDI net inflows	WDIs

Note: WDIs are World Development Indicators, World Bank: FD-IMF is the financial development database IMF.

Descriptive statistics, such as linear regression and correlation, are employed in data analysis. Measures of central tendency, variability, mean, median, standard deviation, minimum and maximum values for financial development and the shadow economy, as well as control variables, will be established in this straightforward statistical description. With the control variables acting as independent variables, correlation analysis is used to determine the degree to which financial development affects the shadow economy. This will provide a first evaluation of the strength and direction of the relationship between the quantities of interest. Panel data models and linear regression analyses are used to quantify the causal effect of financial development for quantifying dependence and the degree to which patterns of financial indicators and the control variables can highlight the subtleties of the size of the shadow economy.

Result of Discussion of Results

Table 2, is categorical as the applied variables give some perception which is descriptive statistics. Descriptive statistics are given for all variables for BRI's countries in this table. The shadow economy is the dependent variable and the shadow economy's mean size (33.31% of GDP) reflects Significant informality across BRI countries, with variability indicated by the standard deviation (11.726), FI mean of 0.371 reflects moderate financial development, mean of (FM: 0.298) with a high variance indicates disparities in market efficiency. The minimum value of SE is given as (9.313) and the maximum value is (53.853). Financial development and financial indicators such as FIA and FID show moderate development levels, while trade openness (mean 55.416%) and internet usage(mean 19.64%) highlight varying degrees of globalization and technological advancement.

Table 2

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
year	504	2006.5	8.086	1993	2020
SE	504	33.31	11.726	9.313	53.853
OFD	504	.341	.231	.029	.797
FIA	504	.272	.27	.001	.97
FID	504	.242	.246	.006	1
FIE	504	.551	.128	.172	.86
FI	504	.371	.205	.055	.799
FMA	504	.249	.248	0	.971
FDM	504	.267	.262	.001	.827
FME	504	.372	.371	0	1
FM	504	.298	.269	0	.822
Trade	504	55.416	29.505	0	140.437
FDI	504	1.887	2.702	-7.24	25.831
Internet	504	19.643	25.247	0	97.862
Unemployment	504	6.687	5.843	.12	31.84

Table 3, Contains the correlation matrix of the variables which is used in this study. Negative correlations between SE and FD indicate, SE with FIA (0.321) and FID (-0.545), however, SE with FI (-0.478) suggests a strong negative relationship between financial institution development and shadow economy. Indicates a similarly negative but slightly weaker relationship between SE and FM, suggesting that higher financial development is associated with a smaller shadow economy. A positive correlation between FD variables (FIA and FID: 0.667) indicates a complementary relationship among financial system components. A positive correlation between FI and FM indices (FI and FM: 0.965) demonstrates interdependency within the financial system.

Table 4, presents regression results exploring the relationship between financial development and the shadow economy. This study indicates the significant negative coefficients for FIA (-0.0705*), FID (-0.0923*) less than (p-value < 0.01), and FI (-0.130*, p < 0.01) confirms that financial development significantly reduces the size of the shadow economy, FM (0.0383) positive but significant, suggest potential inefficiencies in financial markets contributing to SE in some context. The positive coefficient for FMA (0.0366, insignificant) suggests that all financial development indices have a uniform impact. Control variables such as trade

openness (-0.000991*) and FDI (-0.00203*) have significant negative effects on SE, while unemployment (0.00488*) has a positive impact, indicating increased informality during economic distance.

Table 3

Matrix of Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) se	1.000													
(2) ofd	-0.503	1.000												
(3) fia	-0.321	0.826	1.000											
(4) fid	-0.545	0.874	0.667	1.000										
(5) fie	-0.088	0.098	-0.216	0.164	1.000									
(6) fi	-0.481	0.939	0.876	0.926	0.132	1.000								
(7) fma	-0.556	0.900	0.766	0.760	-0.006	0.828	1.000							
(8) fmd	-0.498	0.916	0.619	0.834	0.133	0.807	0.770	1.000						
(9) fme	-0.303	0.833	0.613	0.532	0.036	0.630	0.700	0.756	1.000					
(10) fm	-0.478	0.965	0.720	0.762	0.063	0.815	0.882	0.924	0.920	1.000				
(11) trade	0.085	0.162	0.119	0.147	-0.035	0.138	0.167	0.154	0.138	0.166	1.000			
(12) fdi	0.077	0.070	0.026	0.115	0.005	0.076	0.062	0.076	0.030	0.060	0.327	1.000		
(13) internet	-0.344	0.561	0.661	0.456	-0.092	0.596	0.569	0.465	0.343	0.488	0.212	0.002	1.000	
(14) unem	-0.231	0.181	0.136	0.168	0.190	0.197	0.089	0.220	0.107	0.154	-0.190	-0.162	0.102	1.000

Table 4

Financial Development and Shadow Economy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	SE	SE	SE	SE	SE	SE	SE	SE	SE
Ofd	-0.0101								
	(0.0328)								
Fia		-0.0705***							
		(0.0225)							
Fid			-0.0923***						
			(0.0329)						
Fie				-0.0385*					
				(0.0205)					
Fi					-0.130***				
					(0.0329)				
Fma						0.0366	0.0366		
						(0.0249)	(0.0249)		
Fme								0.00873	
								(0.00984)	
Fm									0.0383**
									(0.0194)
Trade	-0.000991***	-0.000973***	-0.000925***	-0.000989***	-0.000925***	-0.00102***	-0.00102***	-0.00101***	-0.00105***
	(0.000126)	(0.000121)	(0.000124)	(0.000122)	(0.000121)	(0.000122)	(0.000122)	(0.000123)	(0.000124)
Fdi	-0.00203***	-0.00196***	-0.00197***	-0.00195***	-0.00181***	-0.00221***	-0.00221***	-0.00211***	-0.00225***
	(0.000694)	(0.000681)	(0.000683)	(0.000686)	(0.000675)	(0.000692)	(0.000692)	(0.000686)	(0.000688)
Internet	-0.000990***	-0.000777***	-0.000838***	-0.00101***	-0.000712***	-0.00108***	-0.00108***	-0.00102***	-0.00108***
	(9.96e-05)	(0.000104)	(9.56e-05)	(7.32e-05)	(0.000104)	(8.56e-05)	(8.56e-05)	(7.36e-05)	(8.05e-05)
Unem	0.00488***	0.00467***	0.00494***	0.00485***	0.00478***	0.00472***	0.00472***	0.00483***	0.00470***
	(0.000693)	(0.000689)	(0.000689)	(0.000690)	(0.000679)	(0.000697)	(0.000697)	(0.000691)	(0.000693)
Constant	3.471***	3.483***	3.483***	3.489***	3.507***	3.463***	3.463***	3.466***	3.462***
	(0.101)	(0.0935)	(0.0926)	(0.0975)	(0.0125)	(0.0963)	(0.0963)	(0.103)	(0.101)
Observations	504	504	504	504	504	504	504	504	504
Number of ids	18	18	18	18	18	18	18	18	18
R-squared					0.481				

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Conclusion

This study aims to analyze the relationship between financial development (FD) and the shadow economy (SE) in Belt and Road Initiative (BRI) countries. The findings reveal a significant negative relationship between FD and SE, indicating that improvements in financial institutions depth and access effectively reduce the size of the shadow economy. In particular, financial indices like FIA and FID show robust negative impacts with coefficients. However, the financial market index (FM) displayed a positive but significant relationship with SE, highlighting potential inefficiencies in financial markets. Control variables such as trade and FDI also exhibit significant negative effects, while unemployment positively impacts on SE.

These findings align with modernization and inclusion theories, this research provides valuable insights for policymakers in BRI countries. The negative relationship between FD and SE supports modernization and inclusion theories, emphasizing that well developed financial institutions foster economic stability and reduce informal labor and tax evasion. Strengthening financial institutions and promoting financial inclusion can mitigate informal economic activities, while regulatory frameworks should address inefficiencies in financial markets. Additionally, fostering trade openness and technological advancement can further formalize economies.

The study focuses solely on BRI countries, the limitations of this study are that the data limited on secondary data, which may not fully capture informal economic degree. Additionally, variations in data quality across countries could affect results. Further research could incorporate qualitative methods to provide a deeper understanding of informal economic behaviors. Expanding the geographic scope and exploring the impact of emerging financial technologies like blockchain could also offer broader insights.

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