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Article

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PISSN 2234-8867 EISSN 2287-8793
Journal of East Asian Economic Integration Vol. 19, No. 2 (June 2015) 143-166
http://dx.doi.org/10.11644/KIEP.JEAI.2015.19.2.294

Financial Accessibility and Economic Growth

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This paper investigates the empirical evidence on the relationship between financial accessibility and economic growth to test the conventional hypothesis that improved financial accessibility leads to financial development and economic growth. First, we built a dynamic panel model on the relationship between financial accessibility and economic growth with a set of controlled variables. We then used several financial access indicators from 165 countries, collected from 2004 to 2011, applying the generalized method of moments (GMM) estimators to estimate their relationship. From these estimations, we found that high financial accessibility leads to high income in general. In addition, we found that an increase in financial access indicators had a greater impact on economic growth in low-income countries than it did on economic growth in high-income countries.

Keywords: Economic Growth, Financial Accessibility, Financial Services, Financial Systems, GMM
JEL Classification: G15, G17, O16

I. INTRODUCTION

Conventional economic theories suggest that financial development is a vital factor in economic growth. Simply put, financial development can provide financial institutions with more savings and, consequently, provide more financial resources to firms, eventually promoting private investment. At the same time, it can stimulate

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private consumption through the consumption smoothing process or financial risk diversification.

For these reasons, improving financial accessibility or increasing financial inclusion has recently become a subject of considerable interest among policy makers, researchers, and other stakeholders.[1,2] Higher accessibility to financial services means that either savers or borrowers can approach financial institutions more easily or use financial services in a more extensive manner than they could under low accessibility conditions. Particularly, in developing countries with very limited financial accessibility, if more people can gain easier access to financial institutions and make greater use of financial services, then their economic activities can increase. Hence, many governments and international development organizations, such as the World Bank, have tried to improve accessibility to financial services in developing countries for years.[3]

Despite these important arguments, improved financial accessibility might not lead to real-world economic growth. If these financial institutions are not properly managed or are poorly designed, especially in developing countries, then it might worsen the economy's performance. It is well known that considerable costs can occur when opening new branches of a financial institution or providing new financial services to the public. Furthermore, history has shown that excessive competition in the financial market or an over-supply of financial services may cause

[1] Financial accessibility means the level of ease regarding access to financial services by economic agents, while financial inclusion typically means the proportion of individuals and firms that use financial services. Thus, improving financial accessibility indicates an increase in financial inclusion (World Bank, 2014).

[2] In international forums, such as the Group of Twenty (G-20), financial inclusion has moved up the reform agenda. At a summit in June 2012, leaders of the G-20 endorsed the "G20 Basic Set of Financial Inclusion Indicators" (World Bank, n.d.). Furthermore, the International Finance Corporation (IFC) initiated a comprehensive approach to financial inclusion, addressing at least three aspects of financial services and products: access, usage, and quality <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTFINANCIALSECTOR/0,,contentMDK:23218448~menuPK:8711291~pagePK:210058~piPK:210062~theSitePK:282885,00.html> (accessed Sept. 21, 2014)

[3] For example, the World Bank is taking several initiatives for increasing financial access in developing countries. These include (1) enhancing access to finances for micro and small enterprises in Egypt, (2) promoting innovation for inclusive financial access in Egypt, (3) expanding access to financial services through new technological channels in El Salvador, and (4) financial sector assessment program to financial services in Malawi <http://www.worldbank.org/projects/search?lang=en&searchTerm=access%20finance> (accessed Sept. 21, 2014)

banks' performance to deteriorate and sometimes lead to a banking crisis. Improving financial accessibility is also an issue. Recently, electronic banking and financial activities have become so popular in some high-income countries that financial services can occur without clients physically contacting the offices of financial institutions. Clients can perform major banking services, such as money transfers or payments, with a simple touch of the screen on a mobile device or the use of their plastic cards. Thus, it is questionable if installing more bank branches will lead to growth in financial services and greater economic growth.

Very few researchers have provided evidence to test the hypotheses of these theoretical arguments and practical issues; few have empirically investigated the relationship between financial accessibility and economic growth. In particular, no rigorous study with comprehensive data comparing various countries has appeared in the literature. This is mainly due to cross-country data representing financial access that have become available only very recently. In addition, until recently, researchers have not sufficiently emphasized the importance of financial access to promote economic growth. Providing infrastructure, such as highway or railway, has usually taken a higher priority among development agendas.

In this paper, we attempt to fill this gap. We have econometrically examined the relationship between financial access and economic growth. To that end, we have built a simple econometric model for estimation, applying a panel of 165 countries' unbalanced data collected from 2004 to 2011. In addition, we have applied this model to test the impact of financial access on economic growth in countries at different stages of development. And we have considered three development groups in this investigation: low-income countries (LICs), middle-income countries (MICs), and high-income countries (HICs).

This paper has four sections. The first section is an introduction, and the second provides the theoretical background and literature review on this topic. The third (and main) section of this paper shows the model specification and estimation results; several economic implications were derived from this model. The final section contains concluding remarks.

II. THEORETICAL BACKGROUND AND LITERATURE REVIEW

The role of financial systems has long been an important topic in the field of economic development. The pioneering works of Schumpeter (1934) or Knight (1921)

have already emphasized the relationship between finance, entrepreneurship, and economic growth.[4,5] They highlighted the importance of the services of financial intermediaries, such as mobilization of savings, evaluation and selection of projects, management of risk, monitoring of entrepreneurs, and facilitation of transactions, as the vital elements in fostering technical innovation, productivity, and economic growth.

Goldsmith (1969) first documented a statistical relationship between financial development and economic performance, taking data from 35 countries. Under the assumption that the size of a financial system is positively correlated with the supply and quality of financial services, he asserted that financial development leads to economic development. And he based this argument on the positive correlation between the financial interrelation ratio (the ratio of liquid liabilities of a financial system to the GDP) and the GDP per capita. McKinnon (1973) also used several countries as case studies, providing statistical evidence on the relationship between financial depth and economic growth.[6] He concluded that better-functioning financial systems support faster economic growth. Shaw (1973) additionally proposes that government intervention in the development of financial systems constitutes an impediment to economic growth.

More recently, Levine and King (1993) built a more sophisticated model to incorporate the ideas of Schumpeter (1934) and Knight (1921). They argued that financial systems evaluate prospective entrepreneurs and mobilize savings to finance the most promising productivity-enhancing activities. They also insisted that financial systems may diversify the risks associated with these innovative activities, and provide the expected profits to assist engagement in innovation. As a result, they established the following hypothesis: better financial systems improve the probability of successful innovation and thereby accelerate economic growth.

King and Levine (1993) and Levine (1997) studied the empirical link between financial development and economic growth. They found a strong and robust correlation between financial development indicators and economic performance

[4] Schumpeter's ideas were as follows: (1) innovations are induced by a search for temporary monopoly profits and (2) financial institutions are important because they evaluate and finance entrepreneurs who initiate innovative activity and bring new products to the markets.
[5] Knight highlighted the role of entrepreneurship in initiating economic activity.
[6] These case studies included Argentina, Brazil, Chile, Germany, Indonesia, Korea, and Taiwan.

indicators.[7] They also realized that financial indicators could predict subsequent values of growth indicators. From these findings, they concluded that better financial systems stimulate faster productivity and income growth by funneling society's resources to promising productivity-enhancing projects.

Even more recently, a growing body of evidence showed that development of financial institutions—such as banks and insurance companies—and financial markets—such as stock markets, bond markets, and derivative markets—exerts a positive influence on economic development, poverty alleviation, and economic stability (Levine, 1997).

It is Beck et al. (2008) who have provided the first empirical evidence regarding the hypothesis of a positive relationship between accessibility to and usage of financial services and economic development. They used a single-year survey from 2004 among bank regulatory agencies across multiple countries to develop a new data set for the measurement of access to and use of banking services. They found that greater access correlated with the standard measurement of financial development and with economic activity. Furthermore, firms in countries with greater branch and ATM penetration and greater use of loan services reported lower financing obstacles. Thus, higher banking sector access alleviated firms' financing constraints.

Ellis et al. (2010) have also shown empirically that access to financial services enables households to invest in education (which contributes to human capital), to start or expand a business, or to invest in agricultural inputs or new equipment (which contributes to physical capital and technological progress). Specifically, they used the country-comparative case studies to establish a key potential linkage between access to financial services and economic growth. However, they limited their studies to a two-country data set: 2006 and 2009 survey data in Kenya and a 2005 survey data in Tanzania. Furthermore, their analytical tools, such as histograms and simple OLS estimation methods, were very basic.

While these empirical studies had many important implications for this field, the lack of a rigorous econometric study on this relationship, including application of

[7] Financial development indicators applied in their papers are financial depth (ratio of liquid liabilities of financial system to GDP), the importance of banks relative to the central bank, the percentage of credit allocation to private firms, and the ratio of credit issued to private firms to GDP. Economic performance indicators are: rate of economic growth, rate of physical capital accumulation and improvements in the efficiency of capital allocation.

comprehensive data from many countries, is surprising. In particular, there are no studies combining comprehensive data of financial access indicators.

Several reasons may account for this. First, only since 2004 have the International Monetary Fund (IMF) and the World Bank collected and regularly announced the annual data on formal financial accessibility by country. Hence, until now, these data have been relatively limited and too new for economists to apply them. Second, major international financial development institutions, such as the World Bank or ADB, have not paid much attention to promoting economic development by improving financial access or the efficiency of financial markets. Traditionally, these institutions focused on building infrastructure, such as highways or water provision. For example, according to the World Bank's annual report, loans to improve financial services in developing countries counted for only 7.8 percent and 6.8 percent of its total loans from 2005 to 2009 and 2010 to 2014, respectively. Conversely, loans to install social infrastructure, such as energy, mining, and transportation, accounted for 14.3 percent and 16.3 percent for the same years, respectively.

III. MODEL SPECIFICATION AND ESTIMATION RESULT

1. Model Specification

For this paper, we present two major hypotheses. The first represents the conventional wisdom: greater access to financial services may promote economic growth. The second states that the impact of financial access on economic growth may be different for LICs and HICs. In LICs, financial resources are generally scarce and financial accessibility is low; therefore, improving financial access may substantially stimulate economic growth. Conversely, improving financial access in HICs may not stimulate economic growth.[8]

Hypothesis 1: Increased financial access enhances economic growth.

Hypothesis 2: Financial accessibility has a greater impact on economic growth in

[8] In this paper, we use the income levels from the World Bank database to classify the countries. We acknowledge that other classification methods could be used, such as geographical location or the ratio of major industries in a country. However, the extent of the data needed to include those classification methods falls beyond the scope of this paper.

relatively low-income countries than it does in relatively high-income countries.

In this paper, we use a dynamic panel estimation method, applying the annual panel data from 165 countries from 2004 to 2011.[9] Accounting for a small T and large N country-comparative data set with unobserved heterogeneity/effect, as well as possible heteroskedasticity and autocorrelation problems, we specified a dynamic panel data growth model and applied the generalized method of moments (GMM) estimators. We set up the following economic growth model as Equation (1):

$$\Delta Y_{it} = \alpha Y_{it-1} + \beta_j Z_{it} + \gamma FA + \delta_t + \varepsilon_{it}, \qquad (1)$$
$$\varepsilon_{it} = \mu_i + \nu_{it},\ i = 1, \dots, N;\ t = 1, \dots, T$$
$$\nu_{it} \sim \text{iid}(0, \sigma^2),\ \text{and}\ [E(\mu_i \nu_{it}) = 0],$$

where Y_{it} is the log level of the real GDP per capita at constant 2005 prices and Z_{it} is a set of control variables for country i at time t. It includes the log of some conventional variables used in economic growth equations, such as human capital or investment ratio. Financial accessibility is represented by FA. Furthermore, μ_i captures an unobserved country-specific effect; δ_t is a time dummy variable to capture time-specific effects of the fixed effect model; and ε_{it} is a disturbance term. Finally, ν_{it} is assumed to be a serially uncorrelated idiosyncratic shock and to be independent of μ_i.

We can then rewrite Equation (1) as follows:

$$Y_{it} = \tilde{\alpha} Y_{it-1} + \beta_j Z_{it} + \gamma FA + \delta_t + \varepsilon_{it}, \qquad (2)$$

where $\tilde{\alpha} = 1 + \alpha$. We also took four control variables (human capital, investment ratio, government expenditure ratio, and trade openness), which are more extensively expressed in Table 1. Ten indicators, such as the number of bank branches, ATMs, bank accounts, and bank users per population and per area, were used to represent

[9] Generally, the growth equation is estimated with five-year average values of each datum. However, we applied only the annual data because of the data limitations. The number of countries used in the estimation varied for each regression, depending on the data availability of the financial accessibility indicators. Financial access variables were only available from the IMF since 2004.

financial accessibility. For example, if the number of bank branches per square kilometer or per adult population increased from one year to the next, we concluded that people in that area could access banks more easily than before. Our parameter of interest is γ, which shows how the financial access indicators are related to economic growth Y_{it}.

Table 1. Variable Description

Dependent Variables	gdppcap: GDP per capita at constant 2005 USD. Source: World Development Indicator Database, World Bank, 2013
Control variables:	hucap:gross secondary school enrollment. Source: World Development Indicators, World Bank, 2013
	invest: Investment share of GDP (% of GDP). Source: World Development Indicators, World Bank, 2013
	gov: Share of government final consumption expenditure of GDP (% of GDP) Source: World Development Indicators, World Bank, 2013
	trade: share of trade of gross domestic product (% of GDP). Source: World Development Indicators, World Bank, 2013
Financial Accessibility	bran_ad: the number of bank branch per 100,000 adults, Source: IMF
	bran_km: the number of bank branch per 1,000 sq.km, Source: IMF
	atm_ad: The number of atm per 100,000 adults, Source: IMF
	atm_km: the number of ATM 1,000 sq.km, Source: IMF
	fa_ad: joint variables of branch_adult and atm_adult, Source: IMF
	fa_km: joint variables of branch_km and atm_km, Source: IMF
	bor: the number of borrowers per 1,000 adults, , Source: IMF
	dep: the number of depositors per 1,000 adults, Source: IMF
	depa: the number of deposit accounts per 1,000 adults, Source: IMF
	loana: the number of loan accounts per 1,000 adults, Source: IMF

To ascertain the difference that financial accessibility had on economic growth among countries, we estimated Equation (1) with three different groups of countries: LICs, MICs, and HICs. We used STAT Version 13 for all statistical computations, and to check the robustness of the estimation results, we applied two other estimation methods to Equation (2). First, we applied Bruno's bias-corrected LSDV estimation method, as in Bruno (2005a, 2005b) second, we estimated the same equation with the lag independent variable of financial access indicators.

2. Data and Some Stylized Facts

Data of financial access indicators were from the IMF's annual "Financial Access Survey" (FAS). Ten major indicators were used in this model estimation. The first six financial accessibility indicators were measures for the "possibilities of access" to financial services. The number of bank branches and the number of ATMs per 1,000 km2 or per 100,000 adults, respectively, are four of the six variables; the other two are the joint variables of the number of bank branches and ATMs per 1,000 km2 or per 100,000 adults, respectively. The final four indicators are the "real usage" of financial services. They are: the numbers of borrowers and depositors per 1,000 adults and the numbers of deposit accounts and loan account per 1,000 adults.

These indicators only represent the accessibility to commercial bank services. In many countries, the banking sector has played a dominant role in the financial industry. Therefore, we assumed that financial services through banking activity would be dominant with respect to effects on the economy as well. As emphasized in Beck at al. (2008), financial access is not only about providing the possibilities for accessing financial services; it should also include real usage.

Our classification of LICs, MICs, and HICs among the 165 sample countries followed that of the World Bank, as in the Appendix of this paper.[10] Table 2 shows the descriptive statistics of major variables for the 165 countries, covering the period from 2004 to 2011. From this, we found some important implications. First, there are significant differences in major indicators representing financial accessibility across the countries. The standard deviations of several variables are very close to or larger than their means. For example, the mean for the number of bank branches per 1,000 km2 is only 56.9, while its standard deviation is 385.7. Thus, the bank branches were very densely located throughout relatively small areas in HICs but sparsely distributed throughout very large areas in LICs.

Second, relatively speaking, electronic instruments have yet to be widely installed. The average number of ATMs per 100,000 adults was about 2.2 times higher than the number of bank branches per 100,000 adults. This indicates that on average, each bank branch has only two ATMs. Obviously, the installation and managing costs of ATMs are far less than that of a bank branch, and ATMs provide several important basic banking services. Thus, we may say that there is

[10] The number of LICs is 29, while the number of MICs and HICs is 84 and 52, respectively.

room for installment of more ATMs.

Third, Table 2 shows that there still exists many unbanked people in the world, especially in developing countries. The number of depositors per 1,000 adults is 504.5, while the number of deposit accounts per 1,000 adults is 1076.9. Therefore, each depositor has two deposit bank accounts on average, and half of the adults do not have a regular banking service.

Fourth, very few people are provided with credit services from banks. Table 2 shows that only 29.0 percent of adults counted have a loan account, but only 16.2 percent are actually borrowing money from the bank.

Figure 1 shows six graphs that represent the relationship between GDP per capita on the horizontal axis and financial access indicators on the vertical axis. Each graph indicates that the relationship is clearly positive: more financial access leads to more income for everyone. This allows us to assume the first hypothesis as true. Furthermore, some graphs show that the relationship is not linear. It would seem that the relationship is positively correlated at low-income levels, while the relationship is not positively correlated at high-income levels.

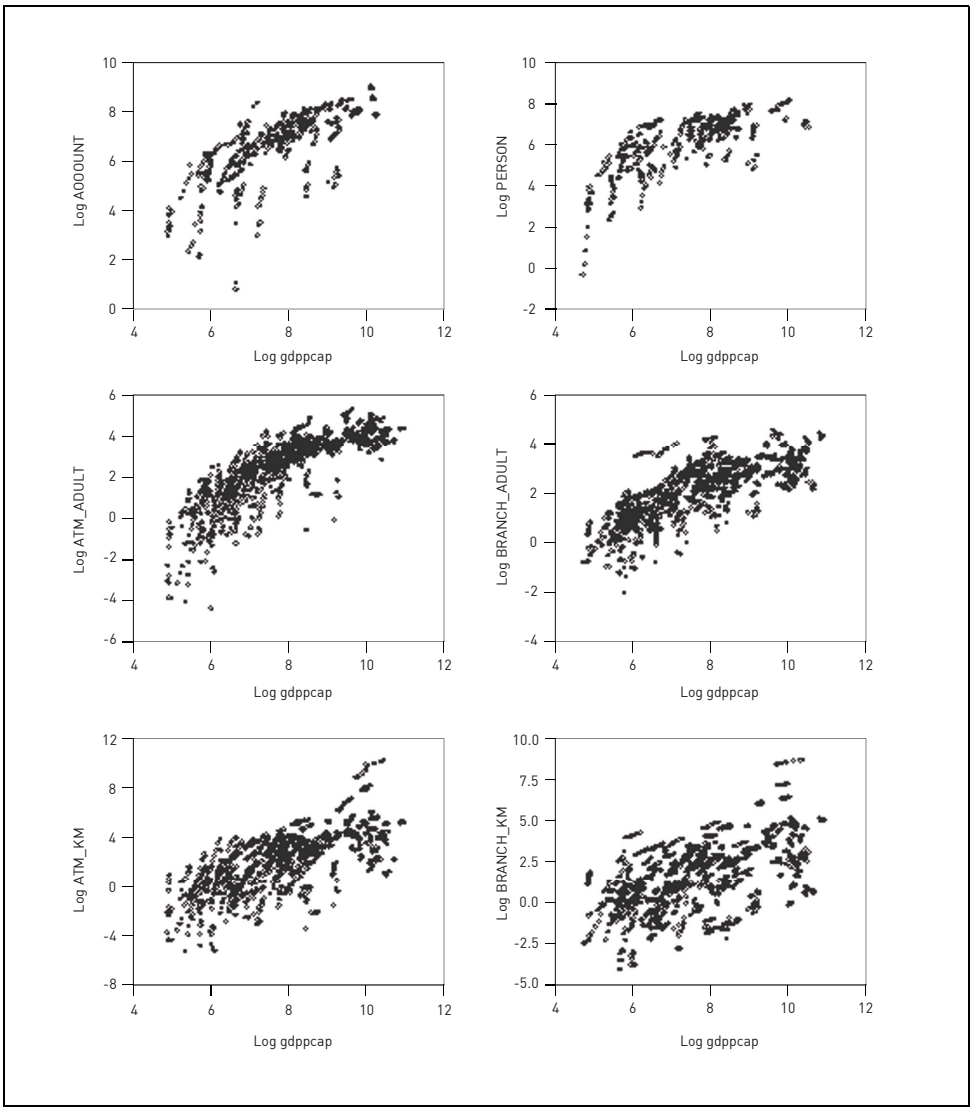
Table 2. Descriptive Statistics of Major Indicators of 165 countries

	# of Obs	Mean	SD	Maximum	Minimum
bran_ad	1270	18.1	19.6	126.1	0.130
atm_ad	1116	39.6	44.4	282.5	0.012
bran_km	1270	56.9	385.7	5892.9	0.011
atm_km	1116	140.3	1057.3	21321.4	0.003
bor	587	161.7	194.9	1045.3	0.019
dep	515	504.5	543.9	3339.4	0.483
Loana	509	290.0	319.6	2361.6	0.385
depa	684	1076.9	1177.0	7984.2	1.232
hucap	967	78.6	27.3	10.8	149.8
invest	1219	23.6	7.6	1.5	68.4
gov	1213	15.6	5.7	2.0	39.5
trade	1254	94.5	53.6	0.3	446.0
gdppcap	1296	10333.1	15312.0	87716.7	127.1

Sources: IMF, Financial Access data base.

Figure 1. Financial Accessibility and Economic Growth

(165 counties' data)



Note: the horizontal axis represents the GDP per capita while the vertical axis represents the financial access indicators.

Sources: IMF, Financial Access data base.

Table 3 represents the average value of financial accessibility indicators across the countries grouped by income level. We extrapolated several important facts from this information. First, the financial access indicators are remarkably differentiated across countries grouped by income. For example, the number of bank branches per 100,000 adults in LICs is only 2.7, while that of MICs and HICs is 14.3 and 31.6, respectively. The number of ATMs per 100,000 adults in LICs is only 2.2, while that of MICs and HICs is 21.6 and 78.1, respectively. And the number of deposit accounts in LICs per 1,000 adults is only 168, while that of MICs and HICs is 809.6 and 2129.5, respectively.

Table 3. Average Values of Financial Accessibility Indicators across the Groups

Variables	LICs (A)	MICs (B)	HICs (C)	All countries	(B/A)	(C/A)
Branch per 100,000 adults	2.7	14.3	31.6	18.0	5.3	11.7
ATMs per 100,000 adults	2.2	21.6	78.1	37.4	9.8	35.5
Branch per 1,000 sq.km	3.5	11.1	174.7	63.1	3.2	49.9
ATMs per 1,000 sq.km	1.6	16.7	450.7	158.2	10.4	281.7
# of borrowers per 1,000 adults	16.0	144.7	372.3	164.2	9.0	23.3
# of depositors per 1,000 adults	131.9	518.0	926.8	508.4	3.9	7.0
# of loan account per 1,000 adults	16.3	234.6	707.2	301.9	14.4	43.4
# of deposit account per 1,000 adults	168.0	809.6	2129.5	1042.9	4.8	12.7

Sources: IMF, Financial Access data base.

Second, the difference among indicators representing electronic instruments across the groups was much larger than that of bank branches. The ratio of ATMs per 100,000 adults in HICs versus LICs was 35.5:1, while that of bank branches per 100,000 adults was 11.7:1. The ratio of ATMs per 1,000 km2 in HICs versus LICs was 281.7:1, while that of bank branches per 1,000 km2 was 49.9:1.

Third, very few people in LICs used banking services. Table 3 shows that per 1,000 adults in LICs, only 131.9 and 16.0 had a deposit account or loan account, respectively. Considering that per 1,000 adults in HICs, 926.8 and 372.3 had a deposit account or loan account, respectively, the numbers in LICs are too small.

3. Estimation Results and Its Implications

The results of the dynamic panel GMM estimators of Equation (1) are shown in Table 4, along with their diagnostic test results. Since we used ten different financial accessibility indicators, ten estimation results are shown. The Hansen

test for the over-identifying restriction determines the validity of instruments and indicates the identification of all models. Arellano-Bond autocorrelation AR(2) tests accept the null hypothesis, for all models, that idiosyncratic shock are not serially correlated. If it fails to reject the null hypothesis, the instruments cannot be valid and the estimations are not reliable.

From these estimation results, we found several important implications. First, the estimated parameters on most conventional variables used in the estimation equation were reasonably signed. The coefficients on human capital, investment, and trade variables were found to be positively relevant. Specifically, human capital and the investment ratio to GDP were significant in many cases. Real GDP per capita was estimated to be negatively related to government consumption. One explanation of this relationship is that LICs usually have a less developed market economy than HICs; as a result, the ratio of government consumption over GDP was relatively high in LICs when compared with that of HICs.

Second, concerning the variable of interest, coefficients on most financial accessibility indicators were positively significant at conventional levels of five percent significance, as seen in columns 1-6 of Table 4. The coefficient on the number of borrowers and the number of depositors in columns 7 and 8 were significant at the ten percent level, while that of the number of deposit accounts was not significant, even at the ten percent level. Thus, higher financial access promotes economic growth in general.

Table 5 shows the estimation result of Equation (1) for all three groups: HICs, MICs, and LICs.[11] As expected with estimates that apply the data from all countries, the estimated coefficient on most control variables was significant at the conventional level. From this, we found several interesting results.

First, the coefficients on the number of bank branches for LICs were significant at the five percent level, while those of ATMs were not significant at that level.

[11] Since the data availability representing financial accessibility was different from country to country, the number of samples was different for each group. For example, the number of samples for LICs with the financial access indicator of the number of bank branches per 100,000 adults was only 19, while that of MICs and HICs was 51 and 41, respectively. In short, we used the data from 13 to 21 countries for LICs, while we used the data from 24 to 62 countries for MICs and 13 to 41 countries for HICs, depending on the availability of financial accessibility data.

Table 4. Estimation Results for All Countries

Variables (in log)	Dependent variable: Log Real GDP per capita - Log(gdppcap)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
L.gdppcap	0.733***	0.729***	0.711***	0.712***	0.631***	0.628***	0.674***	0.570***	0.938***	0.858***
	(0.09)	(0.09)	(0.08)	(0.08)	(0.07)	(0.07)	(0.12)	(0.12)	(0.05)	(0.11)
Human capital	0.068***	0.062**	0.068***	0.071***	0.047*	0.041	0.047	-0.029	0.054*	0.018
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.06)
InvestmentW	0.054***	0.053***	0.061***	0.061***	0.049***	0.048***	0.051***	0.070***	0.059***	0.081***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Government Consumption	-0.068***	-0.068***	-0.085***	-0.084***	-0.085***	-0.085***	-0.071***	-0.072***	-0.071**	-0.070**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
Trade openness	0.005	0.005	-0.004	-0.004	-0.004	-0.005	0.005	-0.029	0.053**	0.013
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)
Bran_ad	0.027**									
	(0.01)									
Bran_km		0.030***								
		(0.01)								
Atm_km			0.015**							
			(0.01)							
Atm_ad				0.015**						
				(0.01)						
Fa_ad					0.025***					
					(0.01)					
Fa_km						0.025***				
						(0.01)				
Bor							0.016*			
							(0.01)			
Dep								0.039*		
								(0.02)		
Loana									0.019**	
									(0.01)	
Depa										-0.011
										(0.04)
Hansen J stat	5.5	5.5	16.3	16.4	15.1	14.9	2.6	3.4	15.3	8.4
Hansen p-value	0.243	0.236	0.297	0.291	0.373	0.388	0.635	0.496	0.356	0.392
Arellano-Bond AR(1) p-value	0.012	0.012	0.008	0.008	0.011	0.012	0.064	0.064	0.051	0.020
Arellano-Bond AR(2) p-value	0.917	0.941	0.851	0.844	0.894	0.861	0.881	0.549	0.855	0.119
Number of Instruments	18	18	28	28	28	28	18	18	28	22
Number of Countries	111	111	104	104	103	103	54	48	45	64

Note: 1) Note: Standard errors are in parenthesis. *,** and *** indicate that the variable is significant at 10%, 5% and 1% level, respectively.

LICs are the countries with the lowest income and poorest financial infrastructure in the world. For them, providing ATMs or other electronic financial devices did not contribute to the expansion of financial services for the public. Simply put, people in LICs are not accustomed to modern financial channels. Traditional banking service channels, such as bank branches, are more meaningful.

Table 5. Estimation Results for LICs, MICs and HICs[1)]

Variables (in log)	Dependent variable: Log(Real GDP per capita - Log(gdppcap)								
	Branch_adult			Branch_km			Atm_km		
	LIC	MIC	HIC	LIC	MIC	HIC	LIC	MIC	HIC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L.gdppcap	0.934***	0.614***	0.925***	0.936***	0.614***	0.921***	0.861**	0.676***	0.785***
	(0.32)	(0.10)	(0.11)	(0.32)	(0.10)	(0.12)	(0.42)	(0.10)	(0.10)
Human capital	-0.038	0.043	0.130*	-0.043	0.042	0.128*	0.033	-0.021	0.170***
	(0.05)	(0.05)	(0.07)	(0.05)	(0.05)	(0.07)	(0.04)	(0.05)	(0.05)
Investment	0.025	0.065***	0.060***	0.025	0.065***	0.059***	0.017	0.086***	0.046***
	(0.03)	(0.02)	(0.01)	(0.03)	(0.02)	(0.01)	(0.04)	(0.02)	(0.01)
Government Consumption	-0.035	-0.066***	-0.078*	-0.035	-0.065***	-0.078*	-0.055	-0.052**	-0.082***
	(0.06)	(0.02)	(0.05)	(0.06)	(0.02)	(0.05)	(0.06)	(0.02)	(0.03)
Trade openness	-0.024	0.002	0.023	-0.025	0.002	0.023		-0.004	0.010
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.02)		(0.03)	(0.03)
FA indicator[2)]	0.033**	0.016	0.009	0.036**	0.017	0.011	0.006	0.030***	-0.003
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Hansen J stat	2.6	3.7	4.5	2.6	3.7	4.4	3.1	15.4	14.5
Hansen p-value	0.621	0.452	0.342	0.619	0.448	0.356	0.533	0.425	0.410
Arellano-Bond AR(2) p-value	0.301	0.260	0.416	0.301	0.253	0.418	0.351	0.650	0.721
Number of Instruments	17	18	18	17	18	18	15	28	28
Number of Countries	19	52	41	19	52	41	15	51	39
Variables (in log)	Dependent variable: Log(Real GDP per capita - Log(gdppcap)								
	Atm_adult			FA_adult			FA_km		
	LIC	MIC	HIC	HIC	LIC	MIC	HIC	LIC	MIC
	(10)	(11)	(12)	(15)	(16)	(17)	(18)	(19)	(20)
L.gdppcap	0.861**	0.595***	0.791***	0.784***	0.796***	0.535***	0.757***	0.726*	0.535***
	(0.42)	(0.10)	(0.10)	(0.11)	(0.20)	(0.10)	(0.11)	(0.41)	(0.06)
Human capital	0.033	-0.025	0.172***	0.182***		-0.036	0.176***		0.025
	(0.04)	(0.05)	(0.05)	(0.05)		(0.05)	(0.06)		(0.05)
Investment	0.017	0.104***	0.047***	0.050***	0.013	0.091***	0.047***	0.066	0.072***
	(0.04)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.04)	(0.02)
Government Consumption	-0.055	-0.038*	-0.083***	-0.073***	0.030	-0.042	-0.067**	0.012	-0.114***
	(0.06)	(0.02)	(0.03)	(0.03)	(0.06)	(0.03)	(0.03)	(0.05)	(0.03)
Trade openness		-0.051	0.010	0.007	-0.006	-0.046	0.004		0.011
		(0.04)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)		(0.03)
FA indicator	0.005	0.033***	-0.005	-0.004	0.019*	0.031***	0.000	0.132***	0.020*
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.01)
Hansen J stat	3.2	15.6	14.6	6.0	3.0	14.8	13.8	0.2	3.0
Hansen p-value	0.532	0.336	0.404	0.197	0.550	0.390	0.464	0.918	0.550
Arellano-Bond AR(2) p-value	0.352	0.293	0.729	0.685	0.465	0.104	0.697	0.299	0.098
Number of Instruments	15	27	28	18	16	27	28	13	18
Number of Countries	15	60	39	39	21	59	39	17	32

Table 5. Continued

Variables (in log)	Dependent variable: Log(Real GDP per capita - Log(gdppcap)									
	Borrowers			Depositors			Loanaccount		Depaccount	
	HIC	LIC	MIC	HIC	LMIC	HIC	LIC	MIC	LIC	MIC
	(21)	(22)	(23)	(24)	(27)	(28)	(19)	(20)	(22)	(23)
L.gdppcap	0.279**	0.865***	0.459***	0.471***	0.837***	0.791***	0.726*	0.535***	0.865***	0.459***
	(0.13)	(0.08)	(0.08)	(0.15)	(0.09)	(0.10)	(0.41)	(0.06)	(0.08)	(0.08)
Human capital			-0.071		0.024	0.278***		0.025		-0.071
			(0.08)		(0.03)	(0.11)		(0.05)		(0.08)
Investment	-0.063*	0.022***	0.102***	0.090	0.082***	0.075***	0.066	0.072***	0.022***	0.102***
	(0.03)	(0.00)	(0.03)	(0.07)	(0.02)	(0.01)	(0.04)	(0.02)	(0.00)	(0.03)
Government Consumption	0.027	0.051***	-0.118***	-0.064	-0.061**	-0.166***	0.012	-0.114***	0.051***	-0.118***
	(0.04)	(0.02)	(0.03)	(0.06)	(0.03)	(0.05)	(0.05)	(0.03)	(0.02)	(0.03)
Trade openness			-0.065		0.017	0.085***		0.011		-0.065
			(0.06)		(0.02)	(0.03)		(0.03)		(0.06)
FA indicator	0.047**	0.006	0.036**	0.026	0.005	0.008	0.132***	0.020*	0.006	0.036**
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.05)	(0.01)	(0.01)	(0.02)
Hansen J stat	5.2	9.7	2.7	12.5	16.4	2.6	0.2	3.0	9.7	2.7
Hansen p-value	0.271	0.470	0.607	0.254	0.287	0.622	0.918	0.550	0.470	0.607
Arellano-Bond AR(2) p-value	0.265	0.221	0.149	0.106	0.142	0.650	0.299	0.098	0.221	0.149
Number of Instruments	15	14	18	14	28	18	13	18	14	18
Number of Countries	15	16	29	15	47	17	17	32	16	29

Note: 1) Standard errors are in parenthesis. *,** and *** indicate that the variable is significant at 10%, 5% and 1% level, respectively.
2) FA indicator means the financial access indicators used in each equation.

Second, the coefficients on the number of bank branches for MICs were not significant at the five percent level, while those of ATMs were significant at that level. MICs are equipped with some financial infrastructure and people in MICs have already experienced some simple electronic financial instruments, such as ATMs or phone banking. Thus, expansion in the field of electronic equipment will enhance the usage of financial services. In addition, an increase of the number of bank branches (as opposed to ATMs) will not guarantee an increase in financial activity.

Third, the coefficients on the number of bank branches and the number of ATMs were not significant at all for HICs. This indicates that HICs already have sufficient physical and electronic financial infrastructures, such as bank branches, ATMs, and internet banking. Any economic agent in these countries may access financial services without difficulty. Thus, improving financial accessibility will not promote more financial activity.

Fourth, several coefficients on the number of borrowers and the number of loan accounts were significant for LICs, MICs, and HICs. Furthermore, the coefficients

on the number of depositors were significant only for MICs, and the number of deposit accounts was not significant for any of the three groups. As a result, the most important variables representing the impact of financial accessibility on economic growth in all three groups were the number of borrowers and the number of loan accounts. Investment and consumption can be promoted through increases in activity to create credit from the banking sector.

Fifth, the law of diminishing marginal product holds for some financial accessibility variables. The financial access indicators, such as bank branches and ATMs, were very high for HICs but low for LICs and MICs. At the same time, the coefficients of variables representing financial accessibility on GDP were very low or insignificant for HICs, while those of LICs were relatively high and significant. Thus, the relationship is not linear and decreases as income and accessibility increases.

In conclusion, we found that all financial access indicators were significant in general. However, when we applied the data of HICs, MICs, and LICs, we found a substantial difference in estimation results among the groups. Thus, if financial authorities or international organizations wish to improve the financial access of LICs or MICs, they should employ more careful or different approaches.

To check the robustness of the estimation results, we applied two other estimation methods for Equation (2). First, we applied Bruno's bias-corrected LSDV estimation method; second, we estimated the same equation with the lag independent variable of financial access indicators. We found that despite these changes, estimation results shown in Tables 6 and 7 were not significantly different from those in Table 4. Most indicators representing financial access were significant at the 5 percent significance level, as they were in Table 3. Thus, financial access is very important in promoting economic growth.

Table 6. Estimation Results for All Countries applying bias-corrected LSDV estimation

Variables (in log)	Dependent variable: Log Real GDP per capita - Log(gdppcap)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
L.Gdppcap	0.890***	0.888***	0.872***	0.872***	0.844***	0.843***	0.788***	0.751***	0.971***	0.955***
	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.01)	(0.05)	(0.00)
Human capital	0.049***	0.046***	0.045***	0.046***	0.034**	0.031*	0.040**	-0.003	0.046	0.041***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.06)	(0.01)
Pop.growth	-0.004	-0.004	-0.005	-0.005	-0.004	-0.004	0.001	-0.003	-0.006	-0.008
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)
Investment	0.058***	0.057***	0.064***	0.064***	0.059***	0.059***	0.052***	0.054*	0.067***	0.066**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.03)	(0.02)	(0.03)
Government Consumption	-0.055***	-0.055***	-0.062***	-0.062***	-0.061***	-0.061***	-0.061***	-0.058***	-0.068***	-0.061***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
Trade openness	0.019	0.019	0.015***	0.015***	0.014***	0.014***	0.017***	0.004	0.047***	0.033***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)
Liquid Liabilities	-0.024	-0.024	-0.021**	-0.021**	-0.019	-0.019	-0.012***	-0.032**	0.001	-0.018***
	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.00)	(0.01)	(0.01)	(0.00)
Bran_ad	0.013***									
	(0.00)									
Bran_km		0.014***								
		(0.00)								
Atm_km			0.007***							
			(0.00)							
Atm_ad				0.006***						
				(0.00)						
Fa_ad					0.011***					
					(0.00)					
Fa_km						0.011***				
						(0.00)				
Bor							0.008			
							(0.02)			
Dep								0.019***		
								(0.01)		
Loana									0.008	
									(0.00)	
Depa										0.002
										(0.00)
Number of Observations	580	580	527	527	514	514	264	225	218	327
Average No. of time periods	4.6	4.6	4.4	4.4	4.4	4.4	4.3	4.0	3.8	4.1
Number of Countries	127	127	119	119	117	117	61	56	57	79

Note: Standard errors are in parenthesis. *,** and *** indicate that the variable is significant at 10%, 5% and 1% level, respectively.

Table 7. Estimation Results for All Countries adding lag values of FA variables

Variables (in log)	Dependent variable: Log Real GDP per capita - Log(gdppcap)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
L.Gdppcap	0.687***	0.683***	0.641***	0.645***	0.584***	0.581***	0.633***	0.574***	0.957***	0.937***
	(0.09)	(0.09)	(0.07)	(0.07)	(0.07)	(0.07)	(0.10)	(0.10)	(0.05)	(0.09)
Human capital	0.066***	0.060**	0.063**	0.066**	0.051*	0.045	0.033	-0.037	0.048	0.016
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)	(0.04)	(0.05)
Pop.growth	0.001	0.001	-0.000	-0.000	0.001	0.001	0.001	-0.005	-0.006	-0.006
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
Investment	0.054***	0.053***	0.057***	0.057***	0.046***	0.046***	0.048***	0.064***	0.064***	0.073***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Government Consumption	-0.074***	-0.074***	-0.071***	-0.071***	-0.072***	-0.073***	-0.069***	-0.050***	-0.071**	-0.051**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
Trade openness	-0.002	-0.001	-0.012	-0.012	-0.018	-0.018	0.025	0.023	0.047	0.021
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)
Liquid Liabilities	-0.013	-0.012	0.001	0.001	0.002	0.003	-0.001	-0.015	-0.001	-0.038
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)
Bran_ad	0.027**									
	(0.01)									
Bran_km		0.029**								
		(0.01)								
Atm_km			0.025***							
			(0.01)							
Atm_ad				0.025***						
				(0.01)						
Fa_ad					0.029***					
					(0.01)					
Fa_km						0.029***				
						(0.01)				
Bor							0.024**			
							(0.01)			
Dep								0.016		
								(0.01)		
Loana									0.018	
									(0.01)	
Depa										0.022
										(0.04)
Lag of FA variable	0.006	0.007	0.001		-0.002	-0.002	-0.006	-0.024	-0.003	-0.052***
	(0.02)	(0.02)	(0.01)		(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)
Hansen J stat	5.8	5.8	16.3	16.8	16.3	16.2	2.6	1.9	14.6	1.27
Hansen p-value	0.214	0.211	0.296	0.331	0.295	0.300	0.625	0.748	0.408	0.529
Arellano-Bond AR(1) p-value	0.013	0.014	0.023	0.015	0.025	0.027	0.024	0.096	0.046	0.005
Arellano-Bond AR(2) p-value	0.999	0.986	0.404	0.662	0.248	0.224	0.752	0.009	0.898	0.104
Number of Instruments	19	19	29	29	29	29	19	19	29	17
Number of country	109	109	96	96	95	95	52	44	42	62

Note: Standard errors are in parenthesis. *,** and *** indicate that the variable is significant at 10%, 5% and 1% level, respectively.

IV. CONCLUDING REMARKS

In this paper, we investigated two questions representing the relationship between financial access and economic growth. The first was whether improving financial access promotes economic growth; the second was whether financial accessibility significantly affects economic growth in relatively low-income countries and high-income countries. We also checked which financial access instruments are important in promoting economic growth for LICs, MICs, and HICs.

To that end, we built a dynamic panel regression model and collected the ten most outstanding financial access indicators for 165 countries on the FAS dataset, along with four standard control variables. After estimating this model through a dynamic panel of GMM estimators, we were able to support the first hypothesis: more financial access leads to higher income for everyone. Nine coefficients out of the ten selected indicators were statistically significant at conventional levels. And when we applied other estimation methods, such as Bruno's bias-corrected LSDV estimation method or introduced slight changes in the independent variables, the estimation results did not change significantly.

To address the second question of our study, we estimated the same equation with three different groups of data: LICs, MICs, and HICs. We found that the parameters for the number of bank branches were statistically significant for LICs in promoting production activity while they are not for MICs and HICs. Conversely, the parameters for the number of ATMs was not statistically significant for LICs but was for MICs. In addition, we found that the impact of financial access indicators on economic growth in LICs was far greater than the impact of those indicators in HICs.

These empirical results indicate that financial accessibility is very important for promoting economic growth of LICs and MICs. Furthermore, financial supervisory agencies and international development organizations should consider these results in initiating economic development in these countries.

Finally, despite these clear test results, we must be cautious in how we interpret them, and we must acknowledge their limitations. First, we should note that the financial access indicators used in this study only addresses the banking sector. While the banking sector accounts for a large share of the financial market, non-bank financial institutions or other financial markets may be very important in some countries. For example, financial markets, such as stock markets and bond

markets, are very important ways for transferring money from savers to borrowers in advanced countries, such as the UK or US. Thus, it may explain why the coefficient of accessibility for the banking sector in HICs was not significant in our study.

Second, we based this analysis on a relatively short period with respect to annual data. Seven years of panel data from 165 countries may not be enough to test the relationship between financial accessibility and economic growth. Furthermore, it is more reasonable to estimate and test economic growth equations with a five-year average for each variable and 40-50 years of long-term data. Thus, it may be too early to say that improvements in financial access led to economic growth. To get more robust test results, we will have to wait for a number of years for the data set to grow.

<Appendix> List of 165 countries

Low Income Countries	Brazil	Morocco	China, P. R.:Macao
Afghanistan, I.R. of	Bulgaria	Namibia	Croatia
Bangladesh	Cameroon	Nicaragua	Cyprus
Benin	Cape Verde	Nigeria	Czech Republic
Burundi	China,P.R.: Mainland	Pakistan	Denmark
Cambodia	Colombia	Panama	Equatorial Guinea
Central African Rep.	Congo, Republic of	Papua New Guinea	Estonia
Chad	Costa Rica	Paraguay	Finland
Comoros	Côte d'Ivoire	Peru	France
Congo, Dem. Rep. of	Djibouti	Philippines	Germany
Ethiopia	Dominican Republic	Romania	Greece
Gambia, The	Ecuador	Samoa	Iceland
Guinea	Egypt	Serbia, Republic of	Ireland
Guinea-Bissau	El Salvador	Solomon Islands	Israel
Haiti	Fiji	South Africa	Italy
Kenya	Gabon	Sri Lanka	Japan
Kyrgyz Republic	Georgia	Sudan	Korea, Republic of
Liberia	Ghana	Suriname	Kuwait
Madagascar	Guatemala	Swaziland	Latvia
Malawi	Guyana	Syrian Arab Republic	Lithuania
Mali	Honduras	Thailand	Luxembourg
Mozambique	Hungary	Timor-Leste	Malta
Nepal	India	Tunisia	Netherlands
Rwanda	Indonesia	Turkey	New Zealand
Sierra Leone	Iran, I.R. of	Ukraine	Norway
Tajikistan	Iraq	Uzbekistan	Oman
Tanzania	Jamaica	Vanuatu	Poland
Togo	Jordan	Venezuela, Rep. Bol.	Portugal
Uganda	Kazakhstan	Vietnam	Qatar
Zimbabwe	Kosovo	West Bank and Gaza	Russian Federation
Middle Income Countries	Lebanon	Yemen, Republic of	Saudi Arabia
Albania	Lesotho	Zambia	Singapore
Algeria	Libya	**High Income Countries**	Slovak Republic
Angola	Macedonia, FYR	Australia	Slovenia
Argentina	Malaysia	Austria	Spain
Armenia	Maldives	Bahamas, The	Sweden
Azerbaijan, Rep. of	Mauritania	Barbados	Switzerland
Belarus	Mauritius	Belgium	Trinidad and Tobago
Belize	Mexico	Brunei Darussalam	United Arab Emirates
Bhutan	Moldova	Canada	United Kingdom
Bolivia	Mongolia	Chile	United States
Bosnia & Herzegovina	Montenegro	China, P.R.:Hong Kong	Uruguay

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First version received on 17 November 2014
Peer-reviewed version received on 23 January 2015
Final version accepted on 10 March 2015