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Financial Development and Geographic Isolation: Global Evidence

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Abstract

Using cross-country differences in the degree of isolation before the advent of technologies in sea and air transportation, we assess the relationship between geographic isolation and financial development across the globe. We find that pre-historic geographical isolation has been beneficial to development because it has contributed to contemporary cross-country differences in financial development. The relationship is robust to alternative samples, different estimation techniques, outliers and varying conditioning information sets.

JEL: F15; G15; N7; O16; O50;
Keywords: Financial development; Isolation; Agglomeration; Globalization

1. Introduction

Is geographical isolation related to development outcomes such as financial development? To the best of our knowledge, the answer to this question is missing in empirical literature. Various aspects of financial development to explain its relative presence or absence have been explored over the past decades, notably: theories related to credit information and power (Stieglitz & Weiss, 1981; Aghion & Bolton, 1992; Djankov, et al., 2007); theory of law and finance (La Porta et al., 1997; Beck et al., 2003); culture (Stulz & Williamson, 2003; Kodila-Tedika & Asongu, 2015a); abuse of market power and competition in the banking sector (Coccorese & Pellecchia, 2010; Coccorese, 2012); globalisation (Asongu, 2014; Asongu & De Moor, 2016); remittances (Osabuohien & Efobi, 2013; Efobi et al., 2015); endowment theory (Beck et al., 2003); the role of the state (Rajan & Zingales, 2003; Becerra et al., 2012; Ang, 2013a); genetic distance (Ang & Kumar, 2014); macro-finance (Rajan & Zingales, 1998; Baltagi et al., 2009); social capital (Guiso et al., 2004) and human capital (Kodila-Tedika & Asongu, 2015b).

The study closest to the present inquiry is Ashraf et al. (2010) who have examined how cross-country differences in the degree of pre-historic geographic isolation affect the contemporary development process with respect to income per capita. The authors have also been motivated by the absence of studies that examine the relationship between pre-historic isolation and contemporary development outcomes. Existing studies on comparative development have emphasised a plethora of ultimate and proximate characteristics underpinning some of the substantial disparities in standards of living across the globe. The relevance of cultural, institutional, geographic, religious fractionalisation, as well as linguistic, ethnic, globalisation and colonisation features, have motivated the debate on the timing of differential economic growth from stagnation to modern growth over the past 200 years. According to Ashraf et al. (2010), whereas the underlying factors have been investigated from the perspective of contemporary effects, less attention has been paid to pre-historic characteristics that have affected contemporary development and cross country differences in economic growth.

The motivation for assessing the nexus between the dawn of human civilization and the modern era builds on the intuition that globalisation has been documented to affect the development process, through *inter alia*: trade (Musila & Sigué, 2010); capital flows (Price & Elu, 2014; Motelle & Biekpe, 2015); foreign aid (Kayizzi-Mugerwa, 2001; Obeng-Odoom, 2013) and technological diffusion (Tchamyou, 2015). According to Ashraf et al. (2010), the reduced ability of societies that are geographically isolated, to gain from progress in global technological frontiers could have compelled independent advancements in technological progress, therefore inducing a fundamental cultural setting that is favourable to innovation and development. Furthermore, geographically isolated societies might have benefited from the diminished threat of predation which logically fostered efficient allocation of resources towards development outcomes and protected property rights, ultimately contributing to the setting of fundamental cultural values that are beneficial to economic development.

In the light of the fact that geographical isolation promoted a fundamental and persistent cultural environment that enhanced development, it is plausible to infer that pre-historic geographical isolation has played a significant role in the development process, hence, influencing contemporary development across the world.

This study exploits pre-historic cross-country geographical isolation differences in order to assess its effect on financial development across the globe. Ashraf et al. (2010) consider pre-historic geographical isolation prior to the advent of airborne and sea-faring technologies of transportation as ultimate proximate underlying some of the cross country differences in living standards across the globe. We find that pre-historic geographical isolation has had a significant beneficial effect on the process of development because it has contributed to contemporary cross-country differences in financial development. The relationship is robust to alternative samples, different estimation techniques, outliers and varying conditioning information sets and the effect of isolation on financial development is depicted in Figure 1.

The rest of the study is structured as follows. The data and methodology are outlined in Section 2. Section 3 presents empirical results while Section 4 covers robustness assessments. Concluding implications and future research directions are provided in Section 5.

2. Data and Methodology

2.1. Data

We examine a sample of 66countries with average contemporary data for the period 2000-2010 and prehistoric data on geographical isolation. The financial development dependent variable is private domestic credit as a percentage of GDP.

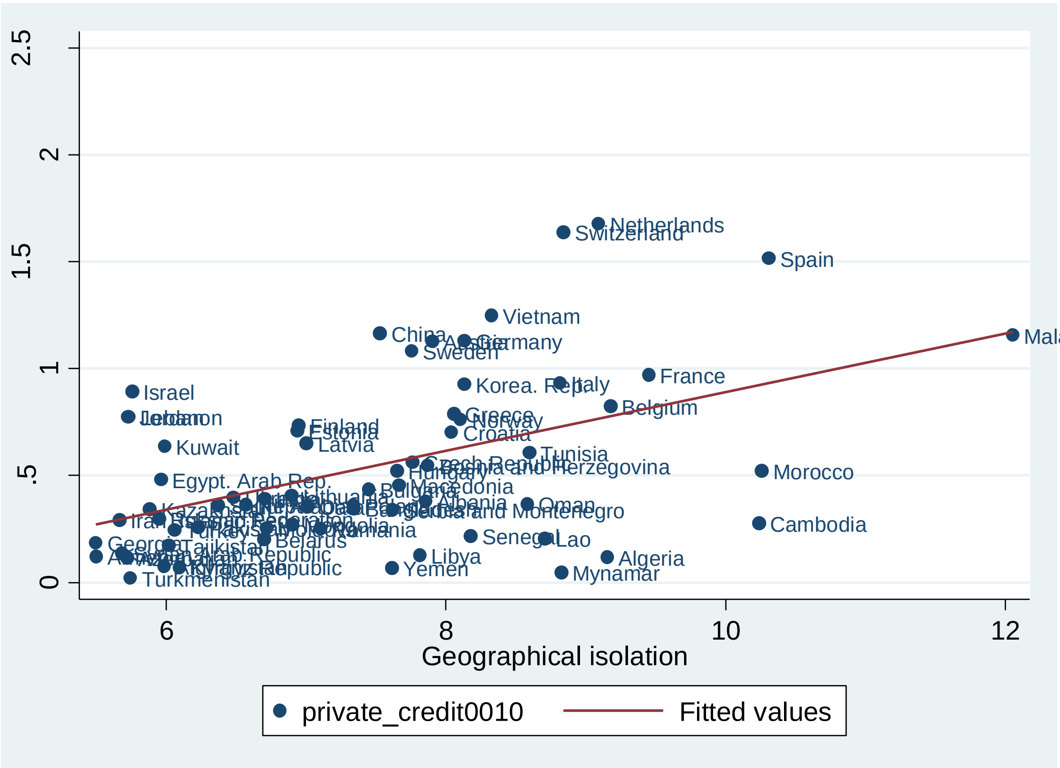

Figure 1: Geographic Isolation and Financial development (2000-2010).[2]

The independent variable of interest is the index of isolation from Ashraf et al. (2010). According to the authors, this is a new indicator of geographical isolation that was prevalent in the distant past and it represents the average time needed to travel from a country's capital to each kilometer square of land on earth, accounting for routes that can minimize the time to travel in the absence of airborne and maritime transportation technologies. The isolation index developed by the authors enables the exploitation of exogenous variation in extent of isolation, before the advent of underlying transportation technologies.

Following Ang and Kumar (2014) and Kodila-Tedika and Asongu (2015b) in recent financial development literature, we control for: aerial isolation, financial openness, trade openness, interaction between financial openness and trade openness, creditors' rights, religions (Protestants, Muslims and Catholics), legal origins (French, British, Scandinavian and German), tropics and latitude. The definitions of the variables, summary statistics and correlation matrix are provided in the Appendix. We discuss the expected signs concurrently with the estimation of results.

2.2. Empirical specification

Consistent with the above and the geographical isolation (Ashraf et al., 20101) literature, we employ Ordinary Least Squares (OLS) in order to assess the nexus between geographical isolation and financial development. The specification is presented in Eq. (1).

$$FD_i = \alpha_1 + \alpha_2 GI_i + \alpha_3 X_i + \varepsilon_i \quad (1)$$

[2]Figure 1 illustrates the partial regression line for the effect of Geographic Isolation on Financial development while controlling for other variables.

Where: $FD_i\,(GI_i)$ represents financial development (geographical isolation) indicator for country i, α_1 is a constant, X is the vector of control variables, and ε the error term. X consists of: aerial isolation, trade openness, creditors' rights protection, financial openness, legal origins, tropics and latitude.

3. Empirical results

Table 1 presents findings based on regressions in Eq. (1). The first column which shows univariate regressions establishes a positive correlation between historical geographic isolation and financial development; that is, a one standard deviation increase in the average time required to walk to a country's capital from all locations in the Old World is associated with 0.48 percentage points increase in financial development and significant at 1 percent. In fact, this indicates that isolation is positively correlated with private sector credit. Columns 2 to 8 examine the nexus conditional on other covariates (control variables). The ordering of the specification is in line with recent financial development literature (Ang & Kumar, 2014; Kodila-Tedika & Asongu, 2015). The positive magnitude varies between 0.086 (Column 7) and 0.159 (Column 3). The coefficient varies from 22.7% in univariate regressions (Column 2) to 66.2% (Columns 7 & 8). This consistent increasing magnitude in the adjustment coefficient is in line with the intuition because the explanatory power of a model should increase with improvements in the conditioning information set.

Most of the significant control variables have the expected signs. These include: (1) the protection of creditor rights has been documented to be linked to higher levels of financial development (La Porta et al., 1998); (2) given that financial openness is connected with availability of more external flows, it should also be linked with more possibilities for private domestic credit; (3) countries with French legal traditions are associated with less financial development (La Porta et al., 2008; Asongu, 2012ab); and, (4) compared to Muslim and

Catholic nations, countries which are dominated by 'Protestants' are more likely to enjoy higher levels of financial development. The edge of the Protestant culture typically builds on the Weber's (1930) 'Protestant Ethic Thesis'. According to Weber, the Northern region of Europe experienced more advanced capitalism because a substantial part of the population was motivated by the Protestant ethic to set-up its own enterprises.[3] It is in this light that the region adopted a culture of: (i) engaging in trade and investment activities for the accumulation of wealth and (ii) working in a secular world. The 'Protestant Ethic Thesis' also elicits the negative nexus between the dependent variable and the 'Muslim dummy'. This is in accordance with the evidence that Muslim nations are less democratic (Fish, 2002, p. 4).

[3]To put it more specifically, those Protestant that were followers of Calvin (the Puritans in Britain and America) were taught that prospering economically was a sign that they were members of the « elect » destined for heaven in the next life. Thus, greed, far from being a deadly sin, were enshrined as a positive good in the culture of both Britain and America.

Table 1: OLS for the relationship between isolation and financial development

	Dependent variable: Private Credit/GDP (2000-2010)							
	I	II	III	IV	V	VI	VII	VIII
Geographical isolation	0.137***	0.141***	0.159***	0.117***	0.123***	0.137***	0.086***	0.137***
	(0.035)	(0.035)	(0.035)	(0.032)	(0.033)	(0.038)	(0.038)	(0.035)
Aerial isolation		-0.017	-0.021	0.015	0.015	0.033	0.056	0.213
		(0.038)	(0.037)	(0.037)	(0.038)	(0.042)	(0.037)	(0.037)
Creditor Rights			0.111**	0.115***	0.098**	0.088**	0.072**	0.176**
			(0.045)	(0.036)	(0.037)	(0.035)	(0.035)	(0.035)
Trade Openness(O)				0.050	-0.059	-0.056	-0.063	-0.063
				(0.146)	(0.145)	(0.145)	(0.133)	(0.133)
Financial Openness(O)				0.198***	0.154*	0.166**	0.105	0.412
				(0.073)	(0.084)	(0.082)	(0.073)	(0.073)
Trade O*Financial O				-0.070	-0.032	-0.049	-0.027	-0.121
				(0.079)	(0.089)	(0.087)	(0.077)	(0.077)
British Legal Origin					-0.109	0.101	0.384	0.305
					(0.156)	(0.223)	(0.318)	(0.318)
French Legal Origin					-0.219*	-0.075	0.266	0.329
					(0.120)	(0.134)	(0.291)	(0.291)
German Legal Origin					-0.044	0.036	0.243	0.261
					(0.114)	(0.119)	(0.259)	(0.259)
Latitute						0.436	-0.749	-0.282
						(0.314)	(0.483)	(0.483)
Tropics						-0.069	-0.396	-0.283
						(0.337)	(0.302)	(0.302)
Catholic Fraction							0.333**	0.244**
							(0.147)	(0.147)
Muslim Fraction							-0.252*	-0.268*
							(0.126)	(0.126)
Protestant Fraction							0.782***	0.427***
							(0.270)	(0.270)
Constant	-0.482*	-0.372	-0.689*	-0.945**	-0.677	-1.212**	-0.676	
	(0.241)	(0.344)	(0.365)	(0.361)	(0.417)	(0.556)	(0.597)	
Observations	66	66	66	65	64	63	63	63
R^2	0.227	0.231	0.296	0.508	0.576	0.590	0.662	0.662

Note: .01 - ***; .05 - **; .1 - *;

4. Robustness checks

In this section, we perform several robustness checks using the specification in Column 7 of Table 1 as baseline. These checks include: controlling for influential observations; using alternative sample periods and varying the conditioning information set.

4.1 Robustness with respect to influential observations

In order to further improve the quality of estimations, we control for influential observations following M-estimators of Huber (1973) by employing iteratively weighted least squares (IWLS). As documented by Midi and Talib (2008), compared to the approach by OLS, the IWLS technique has the advantage of simultaneously controlling for problems arising from the presence of outliers and/or heteroscedasticity. The results in Table 2 in terms of signs and significance remain consistent with those established in Table 1. Moreover, the estimate corresponding to aerial isolation is now significant. Next, in Column 3, we perform the sensitivity check on baseline estimates with control variables, after dropping the smallest observations. The corresponding findings are consistent with baseline results. Lastly, following Nunn and Puga (2012, pp. 25-26) and Kodila-Tedika and Asongu (2015), we adopt a systematic approach of eliminating influential observations for which DFBETA| $>2/\sqrt{N}$, where N is the number of observations. Corresponding findings in Column 4 of Table 2 are consistent with baseline specifications[4].

Table 2: Controlling for outliers

	Dependent Variable: Privatecredit/GDP (2000-2010)		
	IWLS	Omit Smallest	Omit if|DFBETA| $>2/\sqrt{N}$
Geographical isolation	0.125***	0.085**	0.103***
	(0.032)	(0.040)	(0.022)
Aerial isolation	0.054*	0.054	0.058
	(0.032)	(0.037)	(0.037)
Constant	-1.276**	-0.189	-0.644*
	(0.588)	(0.503)	(0.371)
Observations	63	60	52
R^2	0.720	0.654	0.804

Notes: .01 - ***; .05 - **; .1 - *. Control variables in the last column of Table 1 are included.

4.2. Financial development covering alternative sample periods

In Table 3, we employ the alternative sample periods for further robustness purposes. These include: 1980-2010; 1985-2010; 1990-2010 and 1995-2010. The resulting findings confirm the direction of the underlying correlation and further reveal that irrespective of periodicities, the link between financial development and geographical isolation is positive. Moreover, the

[4]"*The DFBETA for a given predictor and for a specific observation is the difference between the regression coefficient calculated for all of the data and the regression coefficient calculated with thatobservation deleted, scaled by the standard error calculated with the observation deleted*" (Seif, 2014, p. 148).

the coefficient on geographical isolation slightly increased from 1980-2010 to 1995-2010. This incremental effect suggests that the nexus is more apparent in the contemporary era.

Table 3: Estimates based on alternative sample periods.

	Dependent Variable: Privatecredit/GDP			
	1980–2010	1985–2010	1990–2010	1995–2010
Geographical isolation	0 .062*	0.065**	0.075**	0.081**
	(0.031)	(0.032)	(0.034)	(0.037)
Aerial isolation	0.027	0.034	0.041	0.049
	(0.031)	(0.033)	(0.035)	(0.036)
Constant	-0.033	-0.072	-0.142	-0.156
	(0.412)	(0.426)	(0.451)	(0.481)
Observations	62	62	62	62
R^2	0.660	0.674	0.676	0.670

Notes: .01 - ***; .05 - **; .1 - *; Control variables in the last column of Table 1 are included.

4.3. Controlling for other effects

In Table 4 below, we control for other impacts to further assess the robustness of our baseline findings. We augment our baseline model with other controls such as: ethnic fragmentation; institutions; social capital; continents and income. The definitions of these variables and corresponding sources are disclosed in the Appendix. From a more general perspective, the new variables account for the unobserved heterogeneity that was not included in baseline regressions. The baseline results are confirmed in terms of significance and sign, though the correlation is lower with the addition of income, institutions and ethnic fractionalization and higher when social capital is added. The additional control variables display anticipated signs because income levels, institutions and social capital are positively related to financial development whereas ethnic fractionalization has the opposite effect, as in Girma and Shortland (2008); Ang and Kumar (2014) and Guiso et al. (2004).

We briefly document the selection of additional covariates. Guiso et al. (2004) have articulated that social capital has been instrumental in improving financial development. The positive role of institutions has also been documented by Girma and Shortland (2008).That ethnic diversity impairs financial development was articulated by (Beck et al., 2003). Asongu (2012a) and Ang and Kumar (2014) have shown that wealthy countries are associated with higher levels of financial development.

Table 4: Controlling for other effects

	Dependent Variable: Privatecredit/GDP (2000-2010)					
	AddEthnic Fractionalization	Add Institutions	Add Social Capital	Add Continents	AddIncome	Add all other effet
Geographical isolation	0.075*	0.060*	0.085**	0.069	0.067	0.097**
	(0.039)	(0.033)	(0.040)	(0.051)	(0.041)	(0.045)
Aerial isolation	0.051	0.058*	0.051	0.076	0.060	0.041
	(0.035)	(0.032)	(0.034)	(0.054)	(0.037)	(0.061)
EthnicFractionalization	-0.330*					0.037
	(0.167)					(0.226)
Institutions		0.059***				0.052**
		(0.020)				(0.025)
Social Capital			0.825**			0.917**
			(0.377)			(0.402)
Europe				0.071		0.132
				(0.205)		(0.233)
Asia				-0.040		0.188
				(0.165)		(0.232)
lgdp2000					0.081*	0.025
					(0.044)	(0.066)
Constant	0.079	-0.750	-0.625	-0.624	-1.316**	-1.258
	(0.533)	(0.589)	(0.612)	(0.610)	(0.561)	(0.743)
Observations	62	63	49	63	63	49
R^2	0.685	0.715	0.790	0.664	0.682	0.838

Notes: .01 - ***; .05 - **; .1 - *; Control variables in the last column of Table 1 are included.

5. Concluding implications and future research directions

There is a recent strand of literature documenting that prehistoric geographical isolation created fundamental cultural effects on the development process that have contributed to contemporary variations in economic development. This study does expand this strand of literature by assessing whether pre-historic geographical isolation is related to development outcomes such as financial development. We have exploited pre-historic cross-country geographical isolation differences in order to assess its effect on financial development across the globe. Pre-historic geographical isolation is defined as prior to the advent of airborne and sea-faring technologies of transportation. We find that pre-historic geographical isolation has been beneficial to development because it has contributed to contemporary cross-country differences in financial development. The relationship is robust to alternative samples, different estimation techniques, outliers and varying conditioning information sets. The findings broadly confirm the positive relationship between geographical isolation and GDP per capita established by Ashraf et al. (2010).

Future studies can improve the extant knowledge by assessing if established linkages withstand further empirical validity when 'contemporary development' is replaced with 'historic development' as an outcome variable. Moreover, assessing the relationship between isolation and other macroeconomic outcomes is also an interesting future research direction.

Appendices

Appendix A. Data sources and summary statistics of variables

Table A1. Definitions and Sources of variables.

Variables	Definition	Source
Privatecredit	Value of financial intermediaries credits to the private sector as a share of GDP (excludes credit to the public sector and credit issued by central and development banks), average over 2000–2010	World Bank WDI online database; Beck et al. (2010)
Creditorrights	An index of the protection of creditor rights in 2000. It reflects the ease with which creditors can secure assets in the event of bankruptcy. It takes on discrete values of 0 (weak creditor rights) to 4 (strong creditor rights)	Djankov et al. (2007)
Trade openness	Sum of exports and imports of goods and services as a share of GDP in 2000	World Bank WDI online Database
Financial openness	Sum of gross stock of foreign assets and liabilities as a share of GDP in 2000	Lane et al. (2007)
Legalorigins	Dummy variable that takes a value of one if a country's legal system is of French, German or Scandinavian Civil Law origin and zero otherwise	La Porta et al. (2008)
Latitude	Absolute value of the latitude of a country, scaled between zero and one, where zero is for the location of the equator and one is for the poles	La Porta et al. (1999)
Tropics	The percentage of land area classified as tropical and subtropical based on the Koeppen-Geiger system	Gallup et al. (1999)
Religion variables	A set of three variables that identifies the percentage of a country's population in the 1980s that follows Catholic, Muslim and Other religion	La Porta et al. (1999)
Ethnic Fractionalization	An index of ethnic fractionalization, constructed as one minus the Herfindahl index of the share of the largest ethnic groups. It reflects the probability that twoindividuals, selected at random from a country's population, will belong to different ethnic groups. The index ranges from 0 to 1 where the higher the value the greater the fractionalization in a country	Alesina et al. (2003)
Institutional Quality	An overall indicator of institutional quality measured as the sum of the six sub-indices for 2000 from World Bank Governance Indicators (WBGI): voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. Countries with higher values on this index have institutions of greater quality	Kaufmann et al. (2010)
Social Capital	Data on trust between individuals in a given country. Measured by taking the percentage of a population that answers 'Yes' to the World Value Survey (WVS) question 'In general, do you think that most people can be trusted?', supplemented by data from the Danish Social Capital Project, the Latinobarometro and the Afrobarometer	Bjørnskov (2008)
Geographical isolation		Quamrul, A., Galor, O. and Özak, O. 2010.
Aerial isolation		Quamrul, A., Galor, O. and Özak, O. 2010.

Table A2.Descriptive statistics

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Private credit	180	0.504	0.463	0.019	2.303
Geographic isolation	68	7.456	1.447	5.501	12.052
Aerial isolation	68	7.918	1.499	6.724	13.101
Creditor rights	216	1.826	0.935	0	4
Trade openness	180	0.883	0.509	0.010	3.720
Financial openness	177	2.156	2.521	0.424	23.977
Latitude	208	0.283	0.189	0.0110	0.8
Tropics	165	0.374	0.436	0	1
Catholic	207	0.320	0.360	0	0.991
Muslim	207	0.219	0.353	0	0.999
Protestant	205	0.145	0.233	0	0.998
Ethnic Fractionalization	188	0 .440	0.258	0	0.930
Institutional Quality	189	2.338	3.782	-6.654	9.419
Social Capital	111	0.262	0.140	0.034	0.654
Income	180	8.528	1.304	5.561	11.142

Table A3. Correlation Matrix (to add geographic isolation and aerial isolation)

Variables	1	2	3	4	5	6	7	8	9	10	11
Private credit (1)	1.000										
Geographic isolation (2)	0.468	1.000									
Creditor rights (3)	0.127	-0.240	1.000								
Trade openness (4)	0.125	0.137	0.138	1.000							
Financial openness (5)	0.571	0.255	-0.063	0.180	1.000						
Latitude (6)	0.206	-0.229	0.191	0.170	0.252	1.000					
Tropics (7)	-0.006	0.355	-0.109	-0.059	-0.167	-0.601	1.000				
Catholic (8)	0.482	0.337	0.072	0.052	0.371	0.347	-0.208	1.000			
Muslim (9)	-0.428	-0.213	-0.154	-0.123	-0.199	-0.500	-0.129	-0.412	1.000		
Protestant (10)	0.395	0.100	-0.028	0.110	0.416	0.529	-0.138	0.001	-0.319	1.000	
Aerial isolation (11)	0.028	0.195	0.011	0.035	-0.190	-0.382	0.709	-0.271	-0.152	-0.115	1.000

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