Lingnan Journal of Banking, Finance and Economics

Volume 4 *2012/2013 Academic Year Issue* Article 3

January 2013

Democracy and economic growth: a perspective of cooperation

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Abstract
Does democracy cause higher economic growth? We build a model taking culture and interpersonal cooperation into account and find that democracy increases economic productivity through giving people more equal rights, which allows people to build a larger interpersonal network so that they can reduce investment risk and employ high-productivity (high-risk) methods in production.

Keywords: Democracy; Cultural Orientation; Risk; Growth

1. Introduction

Economists have for a long time been aware of the influence of democracy on economic development. But theoretical and empirical studies on this topic are largely inconclusive. Some economists think that democracy may harm economic development. They argue that democracy increases demand for redistribution and increases current consumption that consequently reduces investment and does harm to economic growth Huntington (1968); Alesina and Rodrik (1991). Saint-Paul and Verdier (1993), however, stress that redistribution and democratization of a society do not necessarily have adverse effects on growth, as redistribution may increase the level of human capital of the poor.

As well as the theoretical conflicts, most of the empirical studies find ambiguous impacts of democracy on growth. According to a review of 16 empirical studies on the association between democracy and growth reported by Borner and Weder (1995), three studies uncover a positive relation, three negative relation and the remaining ten are inconclusive. Although recent empirical studies employ more advanced econometric tools, there has not been a definite conclusion. *(Please see Aghion & Howitt (2009) for a review of the recent empirical literature.)*

We therefore try to re-study this topic from a new perspective, which takes culture and interpersonal cooperation into account. We establish a model to show that democracy increases economic productivity through giving people more freedom, which allows them to build a larger social network to reduce investment risk so that they are willing to take high-productivity ways in production.

2. Theory

2.1 Cultural Gap and Cooperation

In a society, there are some different cultural groups[1]. Each individual i has a cultural orientation denoted by p_i with $p_i a? ? [0,1]$. Following Gradstein and Justman (2001), we assume no cultural gap between members in each group. Cultural gap is denoted by g and $g_{ij} = |p_i - p_j|$, where *i* and *j* are different individuals.

Cultural gap is related to economic activities in two aspects. The first is that it influences the possibility of cooperation. We use θ to represent the possibility of a successful cooperation, and assume $\theta = \theta(g)$ with $\theta'(g) < 0$, which means that for any two individuals, the possibility of a successful transaction decreases as the cultural gap increases. In addition, $\theta(0) = 1$ and $\theta(1) = 0$.

The second aspect is that cultural gap has a relation with the potential benefit of cooperation. The potential benefit is denoted by b, and it is assumed that $b = b(g)$, $b'(g) > 0$. We may consider b as the return rate of investment or economic productivity. If we understand b as economic productivity, then when an agent invests capital$h$, she obtainsbh^{α}, where α is a parameter reflecting scale economy. This assumption could be understood from the perspective of social networks, especially with the knowledge of structural holes. A structural hole is a void in a social structure, and in terms of social networks refers to an absence of

[1] We may understand cultural groups as the elites and citizens.

connections between groups (Jackson, 2008). According to Burt (2001), if an individual is able to fill structural holes, he may end up with power and control over the flow of information and bring favors between groups. It implies that the potential benefit of cooperation between people with different cultural backgrounds may be substantial.

2.2 Democracy and Economic Productivity

We use a variable d to denote the level of democracy with $d \in [0,1]$, where $d = 1$ represents the most democratic institutions and $d = 0$ is the worst situation. Democracy influences the interpersonal communication between members of different cultural groups. For example, in a democratic country people enjoy more freedom and more equal rights. The elites cannot isolate themselves from the citizens because, for instance, they have to share public facilities with citizens. On the other hand, a nondemocratic country is characterized by more controls over citizens and less communication between the elites and citizens.[2]

A person encounters a large number of people and tries to cooperate with them to produce a common output y. The number of people with the same cultural orientation is N_0. The productivity of cooperating with those people is $b(0)$ with probability of 1, so risk is 0. The number of encounters with different cultural orientation is N_1. N_1 is related to the level of democracy and it is assumed that $N_1 a \leq N(d)$, where $N(d)$ is the upper bound of N_1. This assumption is based on the understanding that, democracy, at the very least, includes equal rights under the law, such as freedom of speech and assembly, equal access to social goods and services. Democracy also includes equal rights in the economic sense, such as equal access to education, health care and other social securities. Because in a democratic political regime people from different classes have to enjoy social goods and services equally, they have more chance to communicate with each other. By contrast, in a less democratic country, the elites often control important resources and isolate themselves from the citizens who are less privileged. As a result, it is less likely for people from different classes to make good communication in such an unequal society.

A perspective explaining why the elites in an undemocratic political regime tend to isolate themselves from the citizens is from the perspective of public services. Democratic states earn fewer monopoly rents and produce a higher level of services than autocracies. It means that in an undemocratic society, the elites, who control the government, tend to provide less public service, while in a democratic society the government would supply much more public services. As a result of limited supply of public services, the elites have to compete with citizens in obtaining those services in an undemocratic society. Unsurprisingly, the simplest way is to isolate themselves from the citizens and announce the access to some public services as privileges of the elites. On the contrary, a democratic society is characterized by more public services than its undemocratic counterparts. The elites, therefore, do not need to establish many privileges so as to isolate themselves from the citizens. The result of less competition between elites and the citizens is more possible cooperation and communication between them.

The productivity of cooperating with them is $b(g)$ with the probability of $\theta(g)$ and risk of $I?_g$ ($I?_g$ is the variance of productivity that equals to $b^2(g)\theta(g)[1-\theta(g)]$).

[2] That is what happened in China. A vivid illustration is China's Household Registration System. An extreme example is the slavery institution.

Agent i invest capital h_i for the production and gains Bh_i^{α}, where B is the expected productivity. All agents are risk averse with the utility function $U(B, I?_r)$, where B and $I?_B$ are expected productivity and risk of the investment portfolio.

$$B = w_0 b(0) + w_g b(g)$$

w_0 and w_g are respectively proportions of capital invested in the cooperation with people of the same or different cultural groups, where $w_0 + w_g = 1$. The agent divides $w_0 h_i$ into N_0 parts and divides $w_g h_i$ capital into N_1 parts. So the risk of the production portfolio is $I?_B = \frac{w_g^2}{N_1} I?_g$.

The utility maximization problem of agent i is described below.

$$Max.\ U(B, I?_B)$$

$$s.t.\ \sigma_B = \frac{w_g^2}{N_1} b^2(g)\theta(g)[1-\theta(g)]$$

$$B = w_0 b(0) + w_g b(g)$$

$$w_0 + w_g = 1; \quad N_1 a?? N(d)$$

It is not difficult to show that the optimal productivity B^* is related to the level of democracy, $B^* = B^*(d)$ and $B^{*\prime}(d) > 0$. Therefore the expected output of the agent is $y_i = B^*(d)h_i^{\alpha}$. Through the process of proof, we can conclude that democracy increases economic productivity through giving people more freedom so that they can build a larger interpersonal network and reduce investment risk.

Proposition1: The optimal productivity is a positive function of democracy level, namely $B^* = B^*(d)$ and $B^{*\prime}(d) > 0$.

Proof: Since $w_0 + w_g = 1$, $B = w_0 b(0) + w_g b(g)$ can be written as $w_g = \frac{B - b(0)}{b(g) - b(0)}$.

Since N_1 is independent and always bounded, we can transform the constraints into $I?_B = M(d)[r - b(0)]^2$, where $M(d) = \frac{b^2(g)\theta(g)[1-\theta(g)]}{N(d)[b(g)-b(0)]^2}$ and $M'(d) < 0$. So the maximization problem becomes $Max.\ U(B, M(d)[B - b(0)]^2)$. The first order condition is $U_B + U_{I?_B} 2M(d)[B^* - b(0)] = 0$. We have $M(d) = -\frac{U_B}{U_{I?_B}} \frac{1}{2[B^* - b(0)]}$, which implies a monotone positive relationship between B and d, because $M'(d) < 0$, $U_{BB} < 0, U_{I?_B} < 0$ and $U_{I?_B B} < 0$. Therefore $B^* = B^*(d)$ and $B^{*\prime}(d) > 0$.

3. Empirical Analysis

3.1 Data and Methods

We are going to test the argument that democracy increases economic productivity. We employ the method of Solow residual to calculate productivity. Production function is written as $Y = AK^{\alpha}H^{\beta}L^{1-\alpha-\beta}$ so that $lnA = lnY - \alpha lnK - \beta lnH - (1 - \alpha - \beta) lnL$, where Y is the total output, K is physical capital, H is human capital, L is population and A is productivity. After estimating productivity, we analyze the influence of democracy on it. In

the econometric model, X are control variables, i and t are country and time indicators respectively. In order to deal with endogenous problem, we adopt the suggestion of Heid et al. (2012) to employ system-GMM estimation, which is contributed by Arellano and Bover (1995), Blundell and Bond (1998), since system-GMM performs well with highly persistent data under mild assumptions.

$$lnA_{it} = \beta_0 + \beta_1 lnA_{it-1} + \beta_2 Democracy_{it-1} + \boldsymbol{\beta_3 X_{it}} + \varepsilon_{it}$$

An unbalanced panel with five-year interval from 1960 to 2000 is employed, which is taken from Acemoglu et al. (2008). There are two different measures for democracy: the Freedom House index and the composite Polity IV index, both of which range from 0 to 1, with 1 representing the most democratic political institution. We use the Freedom House index as our main measure of democracy because of its broad coverage of countries and use Polity IV index for comparison.

3.2 Empirical Results

We can find that democracy increases economic productivity. The results imply that if democracy level increases by 1, economic productivity may increase 0.05 percent at most. Although the temporary economic effect is not very large, the long-run effect (cumulative effect) may be substantial. All of the estimations show that democracy has significant influence on productivity. Therefore, we are able to conclude that our theoretical analysis is credible.

Table1. Regression Results

	Dependent Variable is $log\ Productivity_t$					
	Freedom House Index			*Polity IV*		
	OLS	*Sys-GMM*	*Sys-GMM*	*OLS*	*Sys-GMM*	*Sys-GMM*
$log\ Productivity_{t-1}$	*0.97***	*1.02***	*1.05***	*0.97***	*1.04***	*1.02***
	(0.01)	*(0.03)*	*(0.03)*	*(0.01)*	*(0.003)*	*(0.02)*
$Democracy_{t-1}$	*0.03****	*0.02****	*0.004****	*0.04****	*0.03****	*0.05***
	(0.01)	*(0.01)*	*(0.04)*	*(0.01)*	*(0.01)*	*(0.04)*
Control	*No*	*No*	*Yes*	*No*	*No*	*Yes*
Observations	*547*	*547*	*534*	*502*	*502*	*502*

*, ** and ***denotes the significance at the 10, 5 and 1percent level respectively. Standard errors are in parentheses. *OLS* and *sys-GMM* are ordinary least squares estimation and system GMM estimation. I use proportion of the middle age as control variable.

4. Conclusion

This paper basically completes the analysis of the relationship between democracy and economic growth. In order to make clear whether democracy causes higher economic growth, we build a model taking culture and cooperation into consideration. Through our empirical analysis we find that Polity IV is more effective than Freedom House Index as the consideration factor. We show that democracy allows people to build a larger interpersonal network so as to reduce investment risk. As a result, they tend to use high-productivity (high risk) methods in production.

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Appendix

Dependent Variable: LNAK
Method: Least Squares
Date: 12/13/12 Time: 03:25
Sample (adjusted): 29 2321
Included observations: 547 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LAG_LNAK	0.968929	0.013370	72.47198	0.0000
LAG_FHPOLRIGAUG	0.029854	0.010462	2.853518	0.0045

R-squared	0.911528	Mean dependent var	-0.052157
Adjusted R-squared	0.911366	S.D. dependent var	0.537801
S.E. of regression	0.160111	Akaike info criterion	-0.822248
Sum squared resid	13.97138	Schwarz criterion	-0.806510
Log likelihood	226.8849	Hannan-Quinn criter.	-0.816096
Durbin-Watson stat	1.787390		

Dependent Variable: LNAK
Method: Generalized Method of Moments
Date: 12/13/12 Time: 03:27
Sample (adjusted): 29 2321
Included observations: 547 after adjustments
Kernel: Bartlett, Bandwidth: Fixed (5), No prewhitening
Simultaneous weighting matrix & coefficient iteration
Convergence achieved after: 1 weight matrix, 2 total coef iterations
Instrument list: LAG_FHPOLRIGAUG

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LAG_LNAK	1.028452	0.026683	38.54298	0.0000
LAG_FHPOLRIGAUG	0.018872	0.009410	2.005573	0.0454

R-squared	0.908311	Mean dependent var	-0.052157
Adjusted R-squared	0.908143	S.D. dependent var	0.537801
S.E. of regression	0.162997	Sum squared resid	14.47950
Durbin-Watson stat	1.831875	J-statistic	8.76E-47

Dependent Variable: LNAK
Method: Generalized Method of Moments
Date: 12/13/12 Time: 03:33
Sample (adjusted): 29 2321
Included observations: 534 after adjustments
Kernel: Bartlett, Bandwidth: Fixed (5), No prewhitening
Simultaneous weighting matrix & coefficient iteration
Convergence achieved after: 1 weight matrix, 2 total coef iterations
Instrument list: LAG_FHPOLRIGAUG AGE_MIDAGE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LAG_LNAK	1.052296	0.025823	40.75071	0.0000
LAG_FHPOLRIGAUG	-0.004154	0.037597	-0.110499	0.9121
AGE_MIDAGE	0.094276	0.138247	0.681936	0.4956

R-squared	0.908858	Mean dependent var	-0.055125
Adjusted R-squared	0.908515	S.D. dependent var	0.543012
S.E. of regression	0.164242	Sum squared resid	14.32404
Durbin-Watson stat	1.816062	J-statistic	-2.36E-44

Dependent Variable: LNAK
Method: Least Squares
Date: 12/13/12 Time: 03:38
Sample (adjusted): 29 2321
Included observations: 502 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LAG_LNAK	0.970806	0.013408	72.40557	0.0000
LAG_POLITY4	0.039942	0.010473	3.813910	0.0002

R-squared	0.916842	Mean dependent var	-0.062534
Adjusted R-squared	0.916676	S.D. dependent var	0.551669
S.E. of regression	0.159244	Akaike info criterion	-0.832779
Sum squared resid	12.67936	Schwarz criterion	-0.815972
Log likelihood	211.0276	Hannan-Quinn criter.	-0.826185
Durbin-Watson stat	1.680112		

Dependent Variable: LNAK
Method: Generalized Method of Moments
Date: 12/13/12 Time: 03:45
Sample (adjusted): 29 2321
Included observations: 502 after adjustments
Kernel: Bartlett, Bandwidth: Fixed (5), No prewhitening
Simultaneous weighting matrix & coefficient iteration
Convergence achieved after: 1 weight matrix, 2 total coef iterations
Instrument list: LAG_POLITY4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LAG_LNAK	1.044701	0.027970	37.35035	0.0000
LAG_POLITY4	0.028421	0.009253	3.071665	0.0022

R-squared	0.911791	Mean dependent var	-0.062534
Adjusted R-squared	0.911614	S.D. dependent var	0.551669
S.E. of regression	0.164010	Sum squared resid	13.44962
Durbin-Watson stat	1.710229	J-statistic	2.74E-48

Dependent Variable: LNAK
Method: Generalized Method of Moments
Date: 12/13/12 Time: 03:48
Sample (adjusted): 29 2321
Included observations: 502 after adjustments
Kernel: Bartlett, Bandwidth: Fixed (5), No prewhitening
Simultaneous weighting matrix & coefficient iteration
Convergence achieved after: 1 weight matrix, 2 total coef iterations
Instrument list: LAG_POLITY4 AGE_MIDAGE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LAG_LNAK	1.027725	0.025350	40.54104	0.0000
LAG_POLITY4	0.045217	0.035176	1.285431	0.1992
AGE_MIDAGE	-0.060810	0.134896	-0.450793	0.6523

R-squared	0.913939	Mean dependent var	-0.062534
Adjusted R-squared	0.913594	S.D. dependent var	0.551669
S.E. of regression	0.162162	Sum squared resid	13.12199
Durbin-Watson stat	1.719064	J-statistic	-1.99E-43