Cross-country Growth Regressions to Investigate GDP Growth and TFP Growth

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Abstract

We create a new dataset of educational quality which covers countries of broader growth experience by applying a nonlinear optimization model to linking local and international test programs whose test scores are in different scales. We develop a fixed effects model with instrumental variables to analyze how female human capital, law enforcement, democracy, and other factors relate with the GDP growth and the TFP growth over the recent period 2000-2014. We find that democracy index negatively correlates with the GDP growth and rule of law index negatively correlates with the TFP growth, robust to model specifications and samples. We also estimate that under the smaller sample of more developed countries over the period 2000-2010, one standard deviation increase in assessment test score relates with 5.01 percent increase in the TFP growth.

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1 Introduction

Much previous research studying the GDP growth and the TFP growth from 1965 to 2000 has concluded that empirical studies of the GDP growth and the TFP growth are consistent with neoclassical growth models and endogenous growth theories. However, there is a continuous widening of the world income distribution under the recent period from 2000 to 2014. Assuming that the structural parameters of countries are not very different, the observed widening under the recent period questions the conditional convergence in neoclassical growth models. Moreover, this recent period has many events such as the advance of information and communication technology, the increased gender equality, and the higher level of democracy. Determinants of the GDP growth and the TFP growth during the recent period may differ from those during previous periods.

Thus, empirical evidence on determinants of GDP growth and TFP growth needs to be updated to test growth theories and inform policy decisions, but this research has been limited. Existing research does not study how female human capital, law enforcement, and democracy directly affect GDP growth and TFP growth. Also, it mostly uses years of schooling as a measurement of human capital. However, doing so assumes that the same years of schooling leads to the same increase in productive human capital, regardless of the difference in educational quality.

We study and measure effects of factors on the GDP growth and the TFP growth over the recent period from 2000 to 2014. We create a new dataset of educational quality to measure human capital for countries of broader growth experience by applying a nonlinear optimization model (1). We also use data on voice and accountability index and rule of law index to measure democracy and law enforcement respectively. By exploiting these new data sources, we study how new factors including female human capital, law enforcement, and democracy affect GDP growth and TFP growth by controlling the effects of macroeconomic factors such as inflation rate and demographic factors such as fertility rate.

To estimate the effects of the factors on the GDP growth and the TFP growth, we use cross-country regressions with period fixed effects as the baseline model (2). This fixed effects model allows us to compare changes in the growth outcomes of different countries within each period and thus control for variables varying over periods like the global financial crisis. We augment the fixed effects model with the instrumental variables method (3) to consider the endogeneity of female years of schooling.

Our results show that democracy index and inflation rate are negatively correlated with the GDP growth over 2000-2014. GDP per capita, government consumption ratio, and democracy index are negatively correlated with the GDP growth over 2000-2010 under the smaller sample which consists of more developed countries.

We also observe that rule of law index, inflation rate, and life expectancy are negatively correlated with the TFP growth over 2000-2014. Assessment test score is positively correlated with the TFP growth over 2000-2010 under the smaller sample.

2 Literature Review

In neoclassical growth models such as the Solow Model (Solow, 1956), a production function has a form $Y = BK^{\alpha}L^{(1-\alpha)}$. Y is real GDP. B is total factor productivity. K is physical capital. L is labor. The models assume diminishing returns to capital accumulation by requiring that α is between zero and one. Thus, capital per capita has the steady-state level, which is determined by the condition that the change of capital per capita is equal to zero. In these models, an economy that begins with the quantity of capital per capita below its steady-state level will experience growth in capital per capita k and thus real GDP per capita y along the transition path to its steady state. The growth rate of k gradually declines along its transition to the steady state due to diminishing returns to capital accumulation. Thus, the further an economy is below its steady-state level, the faster the capital accumulates. This indicates that a country's growth rate of real GDP per capita tends to be negatively related with its starting level of real GDP per capita. Once an economy reaches its steady-state level, y grows at the rate proportional to total factor productivity growth. Overall, neoclassical growth models imply that the long-run growth rate of real GDP per capita is merely determined by total factor productivity growth. However, changes in the investment rate, the population growth rate, the level of capital per capita, and the labor force composition affect the difference between the current level of capital per capita and the steady-state level of capital per capita. Thus, these changes will make the economy grow faster or slower than its long-run growth as it transits to the steady state.

The empirical study done by Barro (1997) confirmed many implications of neoclassical growth models. Barro implemented cross-country regressions to find determinants of real GDP per capita growth (GDP growth). The regressions were done by using a panel data of 114 countries from 1965 to 1990. The result was that the lower a country's starting level of real GDP per capita, the higher GDP growth. The regressions also indicated that male years of schooling was positively correlated with GDP growth. Fertility rate, government consumption, and inflation rate were negatively correlated with GDP growth. Following the Barro's analysis, more empirical analysis of determinants of GDP growth was done to confirm neoclassical growth models (Hanushek and Woessmann, 2012).

Neoclassical growth models assume that total factor productivity (TFP) growth is exogenous and leave it unexplained. Endogenous growth theories study TFP. They treat TFP as the way inputs to the production process are transformed into outputs. The Romer Model (Romer, 1990) treats TFP as the number of new ideas which generate inventions of new varieties of intermediate goods. In this model, researchers search for new ideas due to interests in profiting from their inventions. In the Romer Model, the production equation for new ideas is $A = \theta L_A^{\lambda} A^{\phi}$. θ is the rate of producing new ideas. L_A is the number of people attempting to discover new ideas. λ is a parameter between zero and one. $\lambda < 1$ reflects an externality associated with duplication: some of the ideas created by an individual researcher may not be new to the economy as a whole. $\phi > 0$ reflects a positive knowledge spillover in research. Much knowledge in previous research spills over to future researchers. Based on this equation, TFP growth is equal to $\frac{\lambda n}{1-\phi}$, while n is the population growth rate. Thus, TFP growth is determined by an externality associated with duplication, positive knowledge spillover, and population growth.

As an alternative to the Romer Model, the Schumpeterian Model (Dinopoulos and Thompson, 1993) treats TFP as quality improvements in existing intermediate goods instead of inventions of new varieties of intermediate goods. New technology replaces old technology, leading to the increase of TFP in the economy. The knowledge transfer across countries will expedite the process of technology replacement and thus TFP growth. The process for generating TFP growth is similar with that in the Romer Model despite considering the knowledge transfer. These two models indicate that factors that embrace the invention of ideas including human capital and knowledge transfer will increase TFP growth.

Loko and Diouf (2009) did a cross-country empirical study of TFP growth. They used a panel data of 62 countries from 1970 to 2005. First, they used principle component analysis to identify key combinations of policy, human capital, and institutional conditions associated with TFP growth. Secondly, they used a dynamic panel data model to identify TFP growth patterns. They regressed TFP growth on initial income per capita, average inflation rate, and other institutional factors. The results suggested that raising human capital, increasing trade openness level, rationalizing governmental control, and advancing female labor force participation were conducive of higher TFP growth. The results of this study confirmed the implications of endogenous growth theories that explained TFP in terms of the invention of new ideas due to human capital and knowledge transfer.

Endogenous growth theories illustrate that human capital is important for TFP growth.

Most study today measures human capital only in terms of education level. Doing so fails to consider how qualitative aspects of the education system affect TFP growth. Gustafsson (2013) applied a nonlinear programming approach to normalizing test scores from multiple achievement test programs. This approach did not require that all test programs contain one common country, which allowed the inclusion of regional test programs. These normalized test scores were used to compare educational quality across countries.

In sum, although the GDP growth and the TFP growth over 1965-2000 were consistent with neoclassical growth models and endogenous growth theories, little research has been done to investigate whether the consistency holds over the recent period and consider how new factors such as educational quality and democracy affect GDP growth and TFP growth.

To investigate the GDP growth and the TFP growth over the recent period 2000-2014, we develop the cross-country fixed effects regression (2) that builds on the cross-country regressions by Barro (1997). Our approach has new features that previous research does not have. We control for variables varying across periods by using period fixed effects. We find an instrumental variable to consider the endogeneity of female years of schooling. We measure how qualitative aspects of the education system affect the GDP growth and the TFP growth by creating a new international dataset of educational quality following Gustafsson's approach. We also use a new model specification to consider the effects of female human capital, law enforcement, and democracy on the GDP growth and the TFP growth.

3 Data

The data source for real GDP, TFP, and population level of 182 countries from 2000 to 2014 is Penn World Table version 9.0 (Feenstra et al., 2015). Barro-Lee Education Attainment Data v2.1, Feb.2016 (Barro and Lee, 2013) collects the panel data on years of schooling for both male and female aged 25 of 146 countries from 2000 to 2010. World Fertility Data 2015 presents the panel data on fertility rate measured as the mean number of children women have by age 50 of 201 countries from 2000 to 2015 (United Nations, 2015a). The United Nations Population Division's World Population Prospects (United Nations, 2015b) provides the ratio of the female population aged 0-14 to total population of over 100 countries from 2000 to 2010. The data source of the panel data on life expectancy of over 200 countries from 2000 to 2014 is from The World Development Indicators (World Bank, 2014). The data source on government final consumption expenditure of 265 countries from 1960 to 2016 is from World Bank National Accounts Data (World Bank, 2017b). The IMF International Financial Statistics contains the panel data on inflation rate of over 200 countries from 2000 to 2015 (IMF, 2018).

The panel data of voice and accountability index (democracy index) and rule of law index of over 200 countries from 2004 to 2015 comes from The World Governance Indicators (Kaufmann et al., 2010). Democracy index captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Rule of law index captures perceptions of the extent to which agents have confidence in and abide by the rules of society.

The data source for the panel data on mathematics scores is multiple international and local student assessment test programs. Mathematics scores from two international student assessment test programs, PISA and TIMSS, are used. Two local student assessment test programs SACMEQ and SERCE are used to complement the international data source. SACMEQ records mathematics scores of 16 countries in Southern and Eastern Africa in 2000 and 2007. SERCE assesses learning achievement in mathematics of 16 Latin American countries in 2006 (World Bank, 2017a). One limitation of these test programs is that their test scores are in different scales and thus not comparable. The nonlinear optimization model (1) is developed to normalize test scores from each test program so that normalized scores across test programs are comparable on a common scale.

4 Methodology

4.1 Model of Normalizing Test Scores to a Common Scale

The objective function is

$$\begin{aligned} \min_{\alpha_{n=1},\beta_{n=1},\ldots,\alpha_{n=N-1},\beta_{n=N-1}} \quad & \sum_{\mathrm{j=1}}^{\mathrm{J}} \left(\mathrm{W}_j \sum_{\mathrm{i=1}}^{\mathrm{I}} \left(\mathrm{T_{i,n=c}} - \mathrm{T_{i,n=d}}\right)^2 / \mathrm{I} \right) \\ \text{s.t.} \quad & \mathrm{T_{in}} \geq 0, \\ \text{where} \quad & \mathrm{T_{in}} = \alpha_{\mathrm{n}} + \beta_{\mathrm{n}} \mathrm{O_{in}}. \end{aligned} \tag{1}$$

$n \in \{1, \ldots, N-1\}$ indexes an individual test program n except for the one test program whose scale is chosen as the common scale; $j \in \{1, \ldots, J\}$ indexes an individual link j between two test programs c and d; $i \in \{1, \ldots, I\}$ indexes an individual country i which has scores in two test programs c and d associated with a link j.

α_n and β_n are parameters normalizing original test scores in the program n to the common scale; W_j is a weight of an individual link j, which is constructed in a way that each country receives an equal weight regardless of the number of its test scores in all test programs. T_{in} is a normalized test score of country i in program n. T_{in} is calculated from original test score O_{in} through the linear transformation $\mathrm{T_{in}} = \alpha_{\mathrm{n}} + \beta_{\mathrm{n}}\mathrm{O_{in}}$.

The optimization model is constructed to find the optimal values of normalized parameters α and β that minimize the weighted average of differences in normalized test scores of same countries across different test programs. Then, we could use the optimal values of α and β to normalize test scores in different test programs to the common scale. The normalized test scores in the common scale are used to measure and compare educational quality across countries and years.

4.2 Regression Analysis

4.2.1 Fixed Effects Model

Our goal is to estimate the effects of macroeconomic factors, demographic factors, human capital, law enforcement, and democracy on GDP growth and TFP growth through cross-country regressions. The panel data of GDP growth and TFP growth as well as their explanatory factors is constructed for 91 countries over three periods 2000-2005, 2005-2010, and 2010-2014. We use the panel data to implement regressions with period fixed effects. This fixed effects model allows us to control for variables that are constant across countries but varying over periods.

The fixed effects model takes the following form:

$$Y_{it} = \alpha + \beta' X_{it} + \theta_t + \epsilon_{it} \tag{2}$$

for each country i in period t. Y_{it} is GDP growth or TFP growth. X_{it} is a vector of country-level factors that contains factors measured in the beginning of the period t including log real GDP per capita, female years of schooling, rule of law index, and democracy index as well as the annual averages of factors over the period t including log fertility rate, log life expectancy, ratio of government consumption to real GDP, and inflation rate. θ_t are period fixed effects. The key coefficients vector of interest is β, which measures the effects of the explanatory factors on GDP growth or TFP growth.

We also estimate the effect of educational quality on GDP growth or TFP growth by adding assessment test score of each country i in the beginning of period t to X_{it}. Due to the lack of assessment test scores in recent years, the model (2) is estimated by the data over periods 2000-2005 and 2005-2010 after scores are added.

4.2.2 Instrumental Variables Method

We augment the fixed effects model (2) by using instrumental variables method to consider the endogeneity of explanatory variables.

The fixed effects model with instrumental variables is estimated by Two-Stage Least Squares (2SLS). The standard 2SLS model takes the following form:

$$\text{First Stage: } T_{it} = \kappa + \gamma' Z_{it} + \theta_t + \xi_{it} \tag{3}$$
$$\text{Second Stage: } Y_{it} = \alpha^* + \beta^{*\prime} X^*_{it} + \theta_t + \epsilon^*_{it} \tag{4}$$

T_{it} is a vector of endogenous explanatory variables. Z_{it} is a vector of variables which includes instruments for T_{it} and all exogenous explanatory variables. X^*_{it} includes all exogenous explanatory variables and $\hat{T}_{it}$ from the first stage regression.

The main endogeneity concern in the model (2) of GDP growth or TFP growth is that under a constrained government budget, investment in increasing female years of schooling might lead to less government spending on other factors positively affecting GDP growth and TFP growth. Thus, we instrument for female years of schooling. We use the ratio of female population aged 0-14 to total population (female children ratio) as its instrument. We assume that female children ratio is uncorrelated with error terms in the baseline model (2) by exploiting its natural variation.

Table 3 presents results of the first stage regression (3) in the 2SLS model. There is a negative correlation between female children ratio and female years of schooling. The correlation is both large and statistically significant. One percent increase in female children ratio correlates with 0.1678 year decrease in female years of schooling at 1% significance level. This negative correlation is consistent with the existing literature that higher level of female education is correlated with later age of marriage and less child birth per female because women who invest in formal education plan for careers and focus less on motherhood (Goldin, 2016). The negative correlation is also consistent with the possibility that since resources are limited, the higher female children ratio might lead to less spending on education per female. The F-statistics of the first stage regression is 58.375. These results altogether indicate that female children ratio is a strong instrument for female years of schooling.

5 Results

Table 1 reports results on the effects of the factors on the GDP growth and the TFP growth over the period 2000-2014. Column 1 and Column 2 present estimates of the coefficients in β from the fixed effects model (2). Column 3 and Column 4 present IV estimates of the coefficients in β^* from the 2SLS model (4).

Column 3 in Table 1 presents results on the effects on the GDP growth. Inflation rate and democracy index are negatively correlated with the GDP growth at 10% level. Specifically, one percent increase in inflation rate relates with 0.1518 percent decrease in the GDP growth. One standard deviation (SD) increase in democracy index relates with 5.47 percent decrease in the GDP growth.

Column 4 in Table 1 shows results on the effects on the TFP growth. Inflation rate and rule of law index are negatively correlated with the TFP growth at 1% level. Also, life expectancy is negatively correlated with the TFP growth at 10% level. Specifically, one percent increase in life expectancy relates with 0.2527 percent decrease in the TFP growth. One percent increase in inflation rate relates with 0.2544 percent decrease in the TFP growth. One SD increase in rule of law index relates with 5.79 percent decrease in the TFP growth.

Table 2 presents analogous results for the GDP growth and the TFP growth over the period 2000-2010 when we also consider the effect of assessment test score under the smaller sample of more developed countries. IV estimates are not reported here because of high variances of IV estimators under a few number of observations.

Column 1 in Table 2, which reports the effects on the GDP growth over 2000-2010, shows that GDP per capita, government consumption ratio, and democracy index are negatively correlated with the GDP growth at 1%, 5%, and 10% level respectively. Specifically, we find that one percent increase in GDP per capita relates with 0.0274 percent decrease in the GDP growth. One percent increase in government consumption ratio relates with 0.6725 percent decrease in the GDP growth. One SD increase in democracy index relates with 5.05 percent decrease in the GDP growth.

Lastly, we analyze the effects on the TFP growth over 2000-2010 in Column 2 in Table 2. We find that GDP per capita and rule of law index are negatively correlated with the TFP growth at 5% and 1% level respectively, while assessment test score has positive correlation with the TFP growth at 1% level. Specifically, we find that one percent increase in GDP per capita relates with 0.0256 percent decrease in the TFP growth, and one SD increase in rule of law index relates with 11.21 percent decrease in the TFP growth. One SD increase in assessment test score relates with 5.01 percent increase in the TFP growth.

6 Discussion

In this paper, we apply new data and empirical cross-country analysis to investigate the GDP growth and the TFP growth over the recent period 2000-2014. We develop the fixed effects model and find the new instrument for female years of schooling to measure how new factors such as female human capital as well as traditional macroeconomic factors such as inflation rate relate with the GDP growth and the TFP growth.

Our analysis generates several new understandings of the GDP growth and the TFP growth over 2000-2014, robust to model specifications and samples. Democracy index negatively correlates with the GDP growth. Rule of law index negatively correlates with the TFP growth. The evidence implies that participation in government decisions may hinder economic growth, and strong law enforcement may hinder technological innovation.

Inflation rate negatively correlates with the GDP growth and the TFP growth under the full sample of observations of 91 countries over 2000-2014, suggesting the importance of inflation targeting. Life expectancy negatively correlates with the TFP growth under the full sample. This result implies that aging society may hinder technological development, which is consistent with endogenous growth theories that population growth contributes to the innovation of new ideas and thus TFP growth.

GDP per capita and government consumption ratio are not significantly correlated with the GDP growth under the full sample. However, they become negatively correlated with the GDP growth when the period 2010-2014 and less developed countries are dropped for analysis. These results suggest that conditional convergence took place in more developed countries over the period 2000-2010, but question whether it is still taking place after 2010. Also, the possible negative relationship between government consumption ratio and the GDP growth suggests further analysis.

Female years of schooling has a significant positive correlation with the TFP growth under the baseline model. The statistical significance drops under the IV estimation partly due to a higher variance of the IV estimator. It is also important to note that the positive relationship between female years of schooling and the TFP growth increases under the IV estimation. Also, assessment test score positively correlates with the TFP growth. These results imply the probable positive relationship between female human capital and the TFP growth.

While our study delivers some understanding of the GDP growth and the TFP growth over the recent period 2000-2014, we also should note that the lack of a good-as-random assignment mechanism for variables affecting human capital and physical capital makes us wary to push a strongly causal interpretation of coefficients estimates. Also, data measuring democracy and law enforcement reflects subjective perceptions of survey participants. More objective data, such as voter turnout and the number of patent fillings, is needed to shed light on how democracy and law enforcement affect GDP growth and TFP growth.

7 Tables

Table 1: Effects of Factors on the GDP Growth and the TFP Growth over 2000-2014

	(1)	(2)	(3)	(4)
	Fixed Effects		Instrumental Variables	
	GDP Growth	TFP Growth	GDP Growth	TFP Growth
Const	0.3612	0.9859**	0.1312	1.0774**
	(0.6302)	(0.4858)	(0.7076)	(0.5064)
Initial log GDP per capita	-0.0027	-0.0091*	-0.0066	-0.0076
	(0.0053)	(0.0046)	(0.0058)	(0.0048)
Initial female years of schooling	0.0034	0.0118***	-0.0382	0.0283
	(0.0046)	(0.0041)	(0.0260)	(0.0174)
Average log fertility rate	0.0319	-0.0765**	-0.1383	-0.0088
	(0.0392)	(0.0297)	(0.1110)	(0.0771)
Average log life expectancy	-0.0162	-0.1883*	0.1456	-0.2527*
	(0.1376)	(0.1078)	(0.1975)	(0.1975)
Average government consumption ratio	-0.1628	-0.0907	-0.1004	-0.1156
	(0.2858)	(0.2351)	(0.2911)	(0.2311)
Average inflation rate	-0.2000***	-0.2352***	-0.1518*	-0.2544***
	(0.0764)	(0.0547)	(0.0893)	(0.0589)
Initial rule of law index	0.0241	-0.0650***	0.0064	-0.0579***
	(0.0265)	(0.0159)	(0.0266)	(0.0163)
Initial democracy index	-0.0948***	0.0095	-0.0547*	-0.0065
	(0.0273)	(0.0153)	(0.0304)	(0.0210)
Initial democracy index squared	-0.0391***	0.0070	-0.0172	-0.0017
	(0.0157)	(0.0111)	(0.0186)	(0.0132)
Period fixed effects	Yes	Yes	Yes	Yes
Observations	274	274	274	274

Notes: (a) Each column in this table reports on a separate regression. Each regression has 274 observations, i.e. 91 countries observed in periods 2000-2005, 2005-2010, and 2010-2014. (b) Initial rule of law index and initial democracy index are expressed as z-scores. (c) All specifications include period fixed effects. Columns 1-2 present results for the fixed effects model (2). We augment the model by using the instrument for female years of schooling. Columns 3-4 report estimates from the second-stage regression (4) in the instrumental variables method. (d) Heteroskedasticity robust standard errors are in brackets. $^{*}p < 0.1$ $^{**}p < 0.05$ $^{***}p < 0.01$

Table 2: Effects of Factors including Assessment Test Score on the GDP Growth and the TFP Growth over 2000-2010

	(1)	(2)
	Fixed Effects	
	GDP Growth	TFP Growth
Const	1.1833	-0.1106
	(0.9040)	(0.8086)
Initial log GDP per capita	-0.0274***	-0.0256**
	(0.0085)	(0.0112)
Initial female years of schooling	0.0064	0.0079
	(0.0074)	(0.0097)
Initial assessment test score	0.0163	0.0501***
	(0.0188)	(0.0149)
Average log fertility rate	0.0095	-0.0449
	(0.0517)	(0.0507)
Average log life expectancy	-0.1170	0.1301
	(0.1999)	(0.1853)
Average government consumption ratio	-0.6725**	-0.2431
	(0.3339)	(0.4197)
Average inflation rate	-0.2270	0.0676
	(0.4275)	(0.5774)
Initial rule of law index	-0.0370	-0.1121***
	(0.0404)	(0.0368)
Initial democracy index	-0.0505*	0.0121
	(0.0283)	(0.0193)
Initial democracy index squared	-0.0106	0.0087
	(0.0184)	(0.0185)
Period fixed effects	Yes	Yes
Observations	96	96

Notes: (a) Each column in this table reports on a separate regression. Each regression has 96 observations, i.e. 48 countries observed in periods 2000-2005 and 2005-2010. (b) The period 2010-2014 is not included because of the lack of assessment test scores data during this period. (c) All specifications include period fixed effects. Columns 1-2 present results for the fixed effects model (2). The instrumental variables method (4) is not used here because of high variances of IV estimators when the number of observations reduces to 96. (d) Initial assessment test score, initial rule of law index, and initial democracy index are expressed as z-scores. (e) Heteroskedasticity robust standard errors are in brackets. $^{*}\, p < 0.1$ $^{**}\, p < 0.05$ $^{***}\, p < 0.01$

Table 3: The Relationship between Female Years of Schooling and its Instrument Female Children Ratio

	Initial Female Years of Schooling
Const	-4.7127
	(5.2721)
Initial log GDP per capita	-0.1132*
	(0.0661)
Initial female children ratio	-16.784***
	(4.4988)
Average log fertility rate	-0.7646
	(0.9960)
Average log life expectancy	4.2903***
	(1.3043)
Average government consumption ratio	0.2348
	(2.5521)
Average inflation rate	1.4486***
	(0.3998)
Initial rule of law index	-0.3316
	(0.2325)
Initial democracy index	0.5924**
	(0.2711)
Initial democracy index squared	0.3362**
	(0.1639)
Period fixed effects	Yes
Observations	274
F-Statistics	58.375

Notes: (a) This table reports results of the first-stage regression (3) in the instrumental variables method. (b) Initial rule of law index and initial democracy index are expressed as z-scores. (c) Heteroskedasticity robust standard errors are in brackets. $^{*}\, p < 0.1$ $^{**}\, p < 0.05$ $^{***}\, p < 0.01$

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