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Property rights and economic growth: A dynamic GMM analysis

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Abstract

This paper examines the role of property rights and other factors to the growth of real gross domestic product (GDP) per capita. We show using a two-step system generalized method of moments (GMM) dynamic model and a panel data set of around 150 countries from 2006 to 2018 that property rights have a positive and significant effect on the growth of real GDP per capita. The paper also found that human capital, physical capital and inflation have significant effects on real GDP per capita growth.

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1. Introduction

How much does property rights matter when it comes to economic growth? Previous literature has shown that there is a relationship between property rights and economic growth. Acemoglu and Johnson (2005) showed that property rights institutions have an effect on economic growth. Acemoglu *et al.* (2005) used three panel data sets to examine the role of the Atlantic trade and institutional change on the economic growth of Europe. They argue that increased trade provided the impetus for changes within the political institutions of Europe. These changes provided a check to royal power and enabled merchants to obtain more secure property rights. These changes were thus an important factor in economic growth in Europe after 1500. Auerbach and Azariadis (2015) list three ways in which weak property rights affect an economy. First, if property rights are not enforced, people are forced to conduct activities such as rent seeking, corruption, bribery and the like. These are otherwise known as redistributive activities. Second, investment is distorted by weak property rights. The actual size of the economy becomes smaller than its potential size. Lastly, firms are forced to allocate more resources towards security measures (police, courts, security guards, lawyers, etc.) in order to protect their assets from appropriation.

Bose *et al.* (2012) used a semiparametric model to look at the relationship between property rights and economic growth. They found that the relationship between the two is nonlinear and that property rights enforcement helps the economy grow up to some point and then growth starts to decline. Thus, there is an optimal level of property rights and they also found out that the negative effects of property rights start to diminish as financial markets become more mature. Justesen and Kurrild-Klitgaard (2013) studied the interaction effects of property rights and the political separation of powers on economic growth. Estimating fixed effects regressions on a panel data set of more than one hundred countries from the period 1970-2010, they found that the effect of property rights on economic growth increases if there are more veto players (i.e. checks and balances) in government. In a similar vein, Voigt and Guttman (2013) studied the role judicial independence has to play with regard to property rights. Estimating a panel data set of 126 countries with generalized least squares, two-stage least squares, and generalized two-stage least squares, they revealed that if the judicial system is independent enough to guarantee the enforcement of property rights, then those rights would have a positive impact on growth.

Goldsmith (1995) used a data set of 59 transitional and developing countries and found that secure property rights and democratic institutions are associated with medium-term economic growth. Keefer and Knack (2000) also found a positive relationship between property rights and economic growth. They also stated that property rights help lower both income inequality and land inequality. Kerekes and Williamson (2008) used both ordinary least squares and two-stage least squared regressions on cross-sectional data in order to find the link between property rights and growth. They found evidence that well-defined property rights have a positive impact on wealth, collateral, capital formation and long-term fixed capital. Tornell (1997) introduced an economy wherein a common property regime exists in the beginning. Depending on the parameter variables, the economy can either get stuck in the common property regime or can follow a cycle where a shift to private property happens. This shift occurs when the economy becomes rich enough that market players devote resources to create institutions to protect their private profits.

The mechanism analysis of how property rights help drive economic growth is as follows. According to Leblang (1996), property rights set the stage for economic growth because it reduces transaction costs, help stabilize expectations of the behavior of others and help define individual incentives. Property rights lead to economic growth because it encourages cooperation over the use of force. An efficient property rights regime gives individuals the exclusive right to use their own resources and to transfer them voluntarily if they wish. Stronger property rights lead to a more efficient price system which leads to a more effective allocation of resources which then leads to greater creation of wealth (O'Driscoll and Hoskins 2003). A secure property rights regime also helps bring in workers from the informal sector. An entrepreneur from the informal sector who enters the formal sector now has access to credit from the financial markets. They are able to title their assets and use those as collateral in expanding their businesses. Since workers in the formal sector pay more taxes than those in the informal sector, the more workers transfer to the formal sector due to strong property rights, the more tax revenue the government can collect. Haydaroglu (2015) states that effective property rights reduce economic uncertainty and transactions costs. When entrepreneurs feel secure that their property is safe, they are more likely to invest more in their businesses. This added investment results in the coming together of financial resources which help accelerate technological growth. Property rights also help in economic growth because it prevents the waste of resources that leads to the elimination of market distortions. Claessens and Laeven (2003) state that improved property rights lead to a better allocation of assets which then leads to economic growth. According to them, when property rights are insecure, firms will allocate their assets in a suboptimal way which then hinders their growth which then hinders the economic growth of a nation. Lastly, Heitger (2004) mentions that property rights enable people to pursue their individual interests and profit off the fruit of their labor. In his opinion, property rights give people a bigger incentive to produce and preserve wealth as opposed to state ownership.

This paper contributes to the literature by integrating institutional variables like property rights to the growth theory by using the latest dynamic panel data techniques based on the generalized method of moments (GMM) developed by Arellano and Bover (1995) and Blundell and Bond (1998), and the simultaneous equations model, to a collection of data spanning 151 countries from 2006 to 2018. This paper examines the role of property rights and other factors to the growth of real gross domestic product (GDP) per capita. We show using a two-step system generalized method of moments (GMM) dynamic panel data model that property rights have a positive and significant effect on the growth of real GDP per capita. This paper also provides a heterogeneity analysis using a simultaneous equation model with three-stage least squares (3SLS).

This paper is organized as follows. Section 2 describes the data used in this paper. Section 3 discusses the empirical model and methodology used for this study. Section 4 analyzes the estimation results. Lastly, Section 5 provides the conclusion to this paper.

2. Data

The paper uses panel data of 151 countries from 2006 to 2018. The data consists of approximately 1,100 observations. The data for this paper came from multiple sources. Data on real GDP per capita and physical capital were sourced from the World Bank national accounts data and Organization for Economic Cooperation and Development (OECD) National Accounts data

files. For our paper, physical capital is represented by gross capital formation as a percentage of GDP. The primary source for inflation data is the International Monetary Fund (IMF), International Financial Statistics and data files. Inflation data is annual percentage change in consumer prices. Human capital data is represented by the number of years schooling. Data for years schooling come from the United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics (2019), Barro and Lee (2018), ICF Macro Demographic and Health Surveys, United Nations Children's Fund (UNICEF) Multiple Indicator Cluster Surveys and OECD (2018). Years schooling data is represented by the average number of years of education received by people ages 25 and older, converted from education attainment levels using official durations of each level.

Data for property rights, business freedom, government spending, and trade freedom come from the Index of Economic Freedom which is published by The Heritage Foundation. The property rights variable is a measure of how a country's legal framework enables individuals to purchase, keep, and use private property, secured by clearly defined laws that the government enforces effectively. The business freedom variable measures how much the regulatory and infrastructure climates hamper the efficient operation of businesses. The variable for trade freedom measures the impact of tariff and nontariff barriers on a country's exports and imports of goods and services. Lastly, the government spending variable measures the impact of government expenditures on the economy which includes transfer payments that come out of entitlement programs. In addition, Appendix A provides data sources as well as definitions of the variables used from the data. Appendix B provides descriptive statistics of the data.

3. Model

The estimation method for this paper is based on the typical cross-country catch-up equation by Barro and Sala-i-Martin (2003).

$$\ln Y_{it} - \ln Y_{it-1} = a \ln Y_{it-1} + bX'_{it} + +gZ'_{it} + m_i + e_{it} \quad (1)$$

Re-writing as:

$$\ln Y_{it} = f \ln Y_{it-1} + bX'_{it} + +gZ'_{it} + m_i + e_{it} \quad (2)$$

where $f = 1 + a$ and a is the conditional convergence factor. Where *Z'* represents control variables*; X*' represents explanatory variables; m_i is the unobservable country-specific effect and ε_{it} is the error term.

For our econometric model, we use the equation below

$$\ln Y_{it} = f \ln Y_{it-1} + b_1 School_{it} + b_2 PC_{it} + \beta_3 PR_{it} + \beta_4 BF_{it} + \beta_5 TF_{it} + \beta_6 GS_{it} + \beta_7 Infl_{it} + d_t + m_i + e_{it} \quad (3)$$

where *School* is the years of education attainment for human capital, *PC* is the physical capital of a country measured as gross capital formation as a percentage of GDP, *PR* is the property rights variable, *BF* is the business freedom variable, *TF* is the trade freedom variable*, GS* is the

government spending variable and *Infl* is the inflation rate. The variable *d* represents the time trend while m_i represents the unobservable country-specific effect and e_{it} is the error term. Y_{it} represents real GDP and Y_{it-1} is the value of real GDP lagged by one period.

This paper uses the two-step system GMM estimation model. Arellano and Bover (1995) presented a GMM estimator for a model that has time-invariant, strictly exogenous and predetermined variable some of which are not correlated with the effects. According to Teixeira and Queiros (2016) system GMM is able to fix challenges such as measurement error, omitted variable bias, unobserved country heterogeneity problems, as well as potential endogeneity issues that usually have an impact on growth models when fixed effects methods and pooled OLS are being used. According to Blundell and Bond (1998), system GMM is able to correct endogeneity by (1) introducing more instruments to dramatically improve efficiency, and (2) by transforming the instruments to make them uncorrelated (exogenous) with fixed effects. The model builds a system of two equations: the original equation and the transformed one.

According to Blundell and Bond (1998), the error term needs to be free from autocorrelation in order for lagged endogenous variables to be valid instruments. This is the reason why we use the Arellano Bond test for second-order serial correlation (AR(2)). If the null hypothesis of the AR(2) test is rejected, it means that the moment conditions are not valid.

In order to improve the robustness of our results, we also analyze for the simultaneity relationships. Not only that both inflation and government spending have their influence on economic growth, but economic growth also influences inflation and government spending. To address the effects and reserve-effects of inflation and government spending on economic growth, we specify simultaneous equations models (SEM), and the estimation method Three-Stage Least Squares (3SLS) and specifies *Inflation* and *GovtSpend* as endogenous variables. Equations (4) and (5) below represent the simultaneous equations in our model in addition to Equation (3):

$$Inflation_{it} = \gamma_1 ms_{it} + \phi lnY_{it-1} + d_t + \mu_i + \varepsilon_{2it} \quad (4)$$

$$GovtSpend_{it} = \gamma_2 Tax_{i(t-1)} + \phi lnY_{it-1} + d_t + \mu_i + \varepsilon_{3it} \quad (5)$$

where *ms* is the money supply and *Tax* is the tax rate as the exogenous variables for inflation in Equation (4) and government spending in Equation (5) respectively.

4. Results

Table I shows the dynamic panel data estimation results and we see that lagged real GDP per capita, years of schooling, physical capital, and property rights are positive and significant at the 1% level for all five specifications (1 to 5) while the inflation rate is negative and significant for all five specifications. Business freedom is significant in all the specifications where it appears (2 and 5) although the sign is negative in both cases. Trade freedom is positive and significant at the 1% in all the specifications in which it is present (3 and 5) which implies that lower trade restrictions are good for economic growth. A one-point increase in the trade freedom index corresponds to an increase in real GDP per capita growth of 0.04 to 0.05 percentage points. Government spending is negative and significant at the 5% level for specification 4 which implies that excessive amounts of government expenditures and transfer payments are a drag to growth.

The coefficient for lagged GDP per capita is positive, highly significant and less than one for all specifications in Table I implying the conditional convergence result which states that countries with low levels of GDP per capita would have higher growth rates on average (Teixeira and Queiros 2016).

Table I: Dynamic panel data estimation results on the relationship between economic growth and property rights; 12 years, 2006-2018.

Variable	(1)	(2)	(3)	(4)	(5)
Real GDP Per Capita	0.9515***	0.9525***	0.9519***	0.9509***	0.9522***
(ln, lagged)	(0.0013)	(0.0012)	(0.0010)	(0.0013)	(0.0011)
Year Schooling	0.0122***	0.0122***	0.0112***	0.0122***	0.0113***
	(0.0005)	(0.0005)	(0.0004)	(0.0005)	(0.0004)
Physical Capital	0.0018***	0.0019***	0.0019***	0.0018***	0.0020***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)
Property Rights	0.0011***	0.0010***	0.0011***	0.0011***	0.0011***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Inflation Rate	-0.0018***	-0.0018***	-0.0016***	-0.0018***	-0.0016***
	(0.0001)	(0.0001)	(0.0001)	0.0000	(0.0001)
Business Freedom		-0.0001**			-0.0001***
		(0.0000)			(0.0000)
Trade Freedom			0.0004***		0.0005***
			(0.0000)		(0.0000)
Government Spending				-0.0000**	0.0000
				(0.0000)	(0.0000)
Constant	0.2488	0.2500***	0.2207***	0.2572	0.2213
	(4.1587)	(0.0069)	(0.0062)	(3.7358)	(3.2772)
No. of Obs.	1436.00	1436.00	1435.00	1436.00	1435.00
No. of Countries/Group	151	151	150	151	150
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
AR(2)	0.115	0.112	0.122	0.114	0.119
Hansen test	0.158	0.168	0.141	0.157	0.144

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

Looking at the coefficients for Table I, a one-point increase in the property rights index increases real GDP per capita growth by approximately 0.1 percentage points. The property rights coefficients in Keefer and Knack's (2002) study showed positive effects and are similar in magnitude to the results of this study. Meanwhile, the property rights coefficients of Bose *et al.* (2012) and Kerekes and Williamson (2008) also have positive effects but are larger in magnitude compared to our results. Increasing the number of years schooling by one year will increase the growth rate of real GDP per capita by 1.1 to 1.2 percentage points. A one percentage point increase in physical capital increases the growth of real GDP per capita by approximately 0.18 to 0.2 percentage points while a one percentage point increase in the inflation rate decreases the growth rate of real GDP per capita by about 0.16 to 0.18 percentage points.

The p-values for the test of second-order serial correlation AR(2) show that the null hypothesis of no second-order serial correlation is not rejected for all specifications in Table I. This implies that the original error term is serially uncorrelated and the moment conditions are

correctly specified. Hansen (1982) proposed a test of overidentifying restrictions. The p-values for the Hansen test in our results show that the null hypothesis of joint validity of all instruments is not rejected for all specifications in Table I.

Table II. Dynamic panel analysis estimation results for developed and developing countries, and with simultaneous equations model.

	(1)	(2)	(3)	(4)	(5)
Income Group	Developed	Developing	All Countries		
Dependent Variables	Real GDP Per Capita	Real GDP Per Capita	Real GDP Per Capita	Inflation Rate	Government Spending
Exogeneous Variables					
Real GDP Per Capita (ln, lagged)	0.9676*** (0.0043)	0.9431*** (0.0131)	0.6426*** (0.0359)		
Year Schooling	0.0015 (0.0019)	0.0102*** (0.0026)	0.3152*** (0.0175)		
Physical Capital	0.0016* (0.0009)	0.0012** (0.0006)	0.0103*** (0.0015)		
Property Rights	0.0006* (0.0003)	0.0007** (0.0003)	0.0096*** (0.0010)		
Business Freedom	0.0002 (0.0003)	-0.0001 (0.0003)	-0.0173*** (0.0015)		
Government Spending	0.0000 (0.0001)	0.0002 (0.0002)			
Inflation Rate	-0.0017** (0.0008)	-0.0012** (0.0005)			
Trade Freedom	0.0006 (0.0009)	0.0004 (0.0004)	-0.0111*** (0.0020)		
Money Supply				0.1672*** (0.0155)	
Tax Rate (lagged)					0.0015 (0.0042)
Endogenous Variables					
Real GDP Per Capita				-0.4987*** (0.1221)	-4.8674*** (0.4108)
Inflation Rate			-0.0429*** (0.0092)		
Government Spending			0.0317*** (0.0048)		
Constant	0.0000 -	0.0000 -	0.0000 -	12.0125*** (1.2517)	112.2049*** (3.9347)
R-squared	-	-	0.715	0.715	0.148
No. of Obs.	490	753	1128	1128	1128
No. of Countries/Group	49	79	94	94	94
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
AR(2)	0.051	0.240	-	-	-
Hansen test	1.000	1.000	-	-	-

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

In Table II, Columns 1 and 2 show the estimation results of the heterogeneity analysis using dynamic GMM for developed and developing countries respectively, and Columns 3, 4, and 5 show the results which are estimated with three equations simultaneously by using 3SLS. We divide countries into two groups as defined by The World Bank. Developed countries are those considered as having high incomes while developing countries are those which are classified as middle or low income. Specification (1) shows the results for developed countries while specification (2) are the results for developing countries. Specification (3) provides the results for all countries. The reason there are only 94 countries in specification (3) which is supposed to be for all 151 countries is because several countries do not have data for either government spending or inflation. We see that lagged real GDP per capita, physical capital, and property rights are positive and significant for all three specifications while the inflation rate is negative and significant for all three specifications. The property rights coefficients for specification (1) and (2) show that property rights affect economic growth at roughly the same magnitude for both developed and developing countries. Years schooling is positive and significant for specifications (2) and (3). Trade freedom and business freedom are negative and significant at the 1% level in specification (3). Government spending is positive and significant in specification (3) which implies that increases in government expenditures and transfer payments provide a stimulus to growth. Also, the p-values for the test of second-order serial correlation AR(2) show that the null hypothesis of no second-order serial correlation is not rejected at the 5% level for specifications (1) and (2) in Table II. Therefore, the original error term is serially uncorrelated and the moment conditions are correctly specified.

Columns 3, 4 and 5 in Table II represent the three equations used in our simultaneous equation model. This model has three endogenous variables (inflation, government spending, and real GDP per capita) with each equation having time-varying coefficients. Three-stage least squares is used in estimating this model. Column 4 has inflation rate as the dependent variable. This equation shows that money supply has a positive and significant impact on inflation. This finding is supported by Hossain (2018) who found a causal relationship between money supply growth and inflation. Column 4 also shows that real GDP per capita had a negative and significant effect on inflation. This is similar to the paper by Gillman *et al.* (2004) which confirmed the negative relationship between growth and inflation. Column 5 has government spending as the dependent variable. It shows that real GDP per capita has a negative and significant effect on government spending. This finding is echoed by Sabra (2016) which found that economic growth has a negative relationship with government spending which implies that a government tends to spend less in terms of percentage of GDP when a country gets richer.

5. Conclusion

This study has examined the relationship between property rights and real GDP per capita. The results have shown that the amount of physical capital, the number of years in school, and property rights have a positive and significant effect on real GDP per capita growth. The paper has shown the importance of the development of human capital through the accumulation of educational attainment. Thus, investments in education as well as research and development would be helpful in improving a country's economy. The results have also revealed that physical capital is positively related to economic growth. This is because as a country accumulates more capital, its capacity to produce more goods and services increases which enhances its growth

potential. Also, the inflation rate has a negative relationship with per capita GDP growth which implies that rising inflation slows down growth. The results of our heterogeneity analysis in Table II are consistent with our main results found in Table I. The results have also shown that when property rights are secure and enforceable, incentives are then created that help accelerate economic growth. Therefore, governments need to invest in creating effective and efficient property rights regimes which are to the benefit of all players in the market.

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Appendices

Appendix A: Data Definitions and Sources

Variable	Source	Description
Real GDP Per Capita	World Bank national accounts data, and OECD National Accounts data files.	Average number of years of education received by people ages 25 and older, converted from education attainment levels using official durations of each level.
Year Schooling	Source: UNESCO Institute for Statistics (2019), Barro and Lee (2018), ICF Macro Demographic and Health Surveys, UNICEF Multiple Indicator Cluster Surveys and OECD (2018).	Average number of years of education received by people ages 25 and older, converted from education attainment levels using official durations of each level.
Physical Capital	World Bank national accounts data, and OECD National Accounts data files.	Gross capital formation (% of GDP)
Property Rights	Index of Economic Freedom by The Heritage Foundation	The property rights component assesses the extent to which a country's legal framework allows individuals to acquire, hold, and utilize private property, secured by clear laws that the government enforces effectively.
Government Spending	Index of Economic Freedom by The Heritage Foundation	The government spending component captures the burden imposed by government expenditures, which includes consumption by the state and all transfer payments related to various entitlement programs.
Business Freedom	Index of Economic Freedom by The Heritage Foundation	This index measures the extent to which the regulatory and infrastructure environments constrain the efficient operation of businesses.
Trade Freedom	Index of Economic Freedom by The Heritage Foundation	Trade freedom is a composite measure of the extent of tariff and nontariff barriers that affect imports and exports of goods and services.
Inflation Rate	International Monetary Fund, International Financial Statistics and data files.	Inflation, consumer prices (annual %)

Appendix B: Descriptive Data Summary

Variable	Year 2006 - 2018	Mean	Std. Dev.
Real GDP Per Capita	overall	13168.31	18978.87
	between		18967.69
	within		1561.491
Year Schooling	overall	8.076222	3.252179
	between		3.231589
	within		0.4224977
Physical Capital	overall	24.74013	8.24717
	between		7.013684
	within		4.560605
Property Rights	overall	44.81415	24.25345
	between		23.29825
	within		6.636801
Government Spending	overall	64.43065	23.40606
	between		21.78505
	within		8.695211
Business Freedom	overall	59.64843	16.44702
	between		15.31937
	within		5.960418
Trade Freedom	overall	74.58057	12.7417
	between		11.75041
	within		5.034918
Inflation Rate	overall	5.389074	8.896485
	between		6.979635
	within		6.766904