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Is Difference among Political Regimes Significant in Economic Growth?

: An Empirical Study

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이 유 림

Abstract

Is Difference among Political Regimes Significant in Economic Growth? : An Empirical Study

Yurim Lee
Department of Economics
The Graduate School
Seoul National University

Acknowledging the role of institutions in economic growth is a recent trend. Much of the literature that do take political diversity into account also focus on measures such as index on rule of law or democracy index. In this paper, countries are largely divided into two groups, democracy and oligarchy, according to their political systems. However, when distinguishing political regimes, I introduce two other proxies: tax rate and entry barrier to entrepreneurship. In democracies, political power is in the hands of the majority; thus, for more redistribution, tax rates are high and entry barrier to entrepreneurship is low. In contrast, the power is held by the economic elite, or the entrepreneurs, in oligarchies; therefore, tax rates are low and entry barriers are high. This paper presents an empirical model that studies the effect of different political systems on long-run growth. Through fixed-effect regression analysis on panel data, I discuss how high tax rates and low entry barriers, thus more democratic societies, lead to higher economic growth.

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1. Introduction

For several decades, economics was a lone field with no connections to other areas of studies. Economic phenomenon were analyzed and explained by economic factors only. However, a recent trend shows that economists are now beginning to acknowledge the role that other noneconomic sectors play in the economy. It is along this tendency of convergence in academic fields that I focus on the political implications in an economy. Why do states implement such different policies? It is quite clear what actions are efficient in terms of economic growth. Nonetheless, it is believed by experience that knowing and actually carrying out certain actions in a society is a dissimilar matter, leading to discrepancies in economic freedom. It is here that political regimes and institutions come into the spotlight when analyzing economic growth.

This paper obtains its basic motivation from Acemoglu (2008). Here, it assumes that two types of political regimes, democracy and oligarchy, exist. However, when distinguishing political regimes, two measures are introduced: tax rate and entry barrier to entrepreneurship. In democracies, political power is in the hands of the majority; thus, for more redistribution, tax rates are high and entry barrier to entrepreneurship is low. In contrast, the power is held by the economic elite, or the entrepreneurs, in oligarchies; therefore, tax rates are low and entry barriers are high.

The rest of the paper is organized as follows. Section 2 gives an introduction on related literature in economic growth and political economy.

Section 3 discusses the empirical framework used in this paper. Section 4 gives detailed description on the data I employ. Section 5 presents empirical results based on the model and its implications. Section 6 briefly discusses potential extensions and concludes.

2. Literature Review

Why are some countries rich, while the others are poor? What brings out the divergence in growth rates among nations? Until now, scholars involved in the study of economic growth have gone and still are going on endless quests to provide answers for the difference between the wealth of countries. Although some, like Leamer (1998) and Galor, Moav, and Vollrath (2003), found the underlying reason for delays in industrialization in initial factor endowments such as natural resource abundance or distribution of land, it was soon revealed that amount of capital and labor alone was not enough to explain this contrast. Examples of factors that emerged later to further elucidate the issue include technological progress, education, and inequality. According to Romer (1991), Human capital is essential in the research sector in that it generates new products or ideas that trigger technological advance. This is presented empirically in Barro (1991), where he uses initial (1960 in this case) level of GDP per capita and school enrollment rates as proxies of initial and physical capital. "The cross-section evidence of countries show that the growth rate of real per capita GDP is positively related to initial human capital and negatively related to initial level of real per capita GDP" (Barro

1991, 407).

Many studies also link the factors mentioned above with politics to furnish a more detailed justification on growth rates. Krusell and Rios-Rull (1996) point out how incumbent innovators have sufficient influence in politics to deter the emergence of superior technologies, which restricts the process of technological change necessary for economic growth. Inequality is also seen as harmful for growth, as it reflects distributional conflicts in a society that lead to less allocation of resources to growth promoting activities (Persson and Tabellini 1994). Alesina and Rodrik (1994) further provide evidence of how economic growth and welfare do not go hand in hand. They show that, in a society consisting of only capitalists and workers, maximizing the economy's growth rate is the optimal policy only for governments that care about capitalists. Engerman and Sokoloff (1977) focus on the cases of U.S. and Canada exclusively, finding the reason for their economic success in the difference in degree of inequality in wealth, human capital, and political power. Education also participates in demonstrating the path of economic growth. In Bourguignon and Verdier (2000)'s model, education is both a stimulator of growth and a determinant of political participation. As a consequence, depending on initial conditions, some developing economies become locked in a state with slowly growing authoritarian regimes with low incomes, while others are on a dynamic path with rapid growth, democratization, and the emergence of a middle class. Acemoglu, Aghion, and Zilibotti (2006) highlight the role of high-skilled managers for innovation, since they engage in both the adaptation of technologies from the world and innovation activities. Voting system is mentioned

alongside as well in works such as Romer (1975) and Roberts (1977).

It is from this attempt that recent 10-15 years of work introduce the role of institutions that was somewhat neglected in the commonly named mainstream economics. For instance, Acemoglu, Johnson, and Robinson (2002) find the reversal of economies that were rich in the 1500s in the difference of the institutions the Europeans introduced. This is due to the fact that the Europeans tended to take advantage of then-superior civilization through tax or plantations, while they employed institutions that encouraged investment in poor countries. This point of view is also developed in Acemoglu, Johnson, and Robinson (2005), suggesting that increased political power of merchant groups enabled them to demand significant changes in institutions to protect their property rights. Similar arguments are made in Acemoglu, Johnson, and Robinson (2000), although in this case they relate mortality rates of European colonists to the type of institutions the colonists establish. Robinson and Nugent (2001) go a step further, suggesting that not only the initial institutional difference but also the comparative institutional evolution critically determined the difference in economic growth. According to the paper, this evolution is a result of diverse legal environment stemming from differences in the nature of political competition.

Still, the main focus of related literature on the properties of institution varies. Meltzer and Richard (1981) stress the size of government, or redistribution, by demonstrating the positive relationship between the difference of mean income and income of the decisive voter and the approval for redistribution. On the other hand, some studies point out specific policies or actions of institutions. Parente and

Prescott (1999) articulate that poor countries are poor since they employ arrangements such as protected monopoly rights that lead to inefficient use of inferior technologies. Sonin (2003) also addresses this matter, evincing how the rich may favor poor protection of property rights since they have the incentives to invest in private property protection. Caselli and Gennaioli (2003) refer to dynastic management, "the inter-generational transmission of control over assets that is typical of family-owned firms", as a potential source of inefficiency. Some, like Xu (2011), highlight the individual case of China as a successful example of unique reforms on China's institutions. Although the superiority of institutions, especially those that are liberalized or democratized, should not be trusted blindly (see, e.g., Chang 2011), it is hard to entirely doubt the effect that institutions have on the economic growth.

3. Empirical Framework

3.1 Basic neoclassical growth model

I first consider a basic neoclassical growth model such as Solow (1956) and Barro (1991). Here, classical measures are used to capture a country's proximate determinants of economic growth: variables such as investment, education, and population growth. The equation for a standard growth model is given by:

$$g_{it} = \alpha + X'_{it}\beta + \varepsilon_{it}$$

$$= \alpha + \beta_1 \ln(y_{i,int}) + \beta_2 \ln(k_{it}) + \beta_3 \ln(h_{it}) + \beta_4 \ln(n_{it} + g + \delta)$$

$$+ \beta_5 \ln(gc_{it}) + \varepsilon_{it}$$

$$\text{for } t = 1, \cdots, \text{T and } i = 1, \cdots, \text{N}; \quad \text{E}(X_{is}\varepsilon_{it}) = 0 \; \forall \, s, t. \tag{1}$$

where g_{it} is annual growth rate of real per capita GDP of country i in period t, $y_{i,int}$ is initial real per capita GDP of country i, k_{it} is the investment rate, h_{it} is average years of schooling for ages 15 and up, n_{it} is population growth rate over period t for country i, g is the growth rate of technology, δ is the depreciation rate, and gc_{it} is the government consumption. Following Mankiw et al. (1992), I assume that the sum of the growth rate of technology and the depreciation rate is constant and equal to 0.05. For initial GDP per capita, I employ the value of period 0 on period 1 to 5: for example, for years from 1971 to 1975, I use per capita GDP of 1970 as the initial value, that of 1975 for years from 1976 to 1980, and so forth. The model in Eq. 1 consists of variables that Levine and Renelt (1992) see as being robust determinants of growth. They are also introduced in Mankiw et al. (1992) and are further developed in many other studies.

3.2 Adjusted model with features of political environment

In addition to the neoclassical growth model described above, I adopt the features of political environment described by Acemoglu (2008). In the paper, there exist an infinite number of risk neutral agents that are divided into two types at every period t, worker or entrepreneur. While both groups have the same

productivity if they become workers, the productivity as an entrepreneur differs. At every period t, each agent will be given entrepreneurial skills and will either possess a business or not. Each will make a decision on whether to become a worker or an entrepreneur; then, those who choose to become an entrepreneur makes investment, employment, hiding decisions, and pay entry cost to entrepreneurship if not an incumbent. Here, hiding decision refers to entrepreneurs concealing their revenues in order to avoid taxation. This puts an upper barrier on the level of implementable taxation. Agents also select policies through majority voting. They choose the level of tax rate on output, lump-sum transfer for each agent (which can be seen as welfare policies and are appropriated from tax revenues only), and entry cost to entrepreneurship. Under this environment, there exist two possible types of equilibrium. First is entry equilibrium, where only agents with high abilities become entrepreneurs. This equilibrium is usually spotted in a democratic society. In oligarchy, however, sclerotic equilibrium occurs, where agents with businesses, or incumbents, stay as entrepreneurs regardless of one's abilities.

This discrepancy between regimes can be traced back to the question of who possesses political power. In oligarchy, the economic elite, or the incumbents, holds political influence. Due to this aspect, policies are set to protect the interests of the entrepreneurs, i.e., low taxes and high entry costs to hinder newcomers from entering. On the other hand, in democratic societies, political power is in the hands of the majority. Thus, high tax rates for substantial lump-sum transfers and low entry costs are favored by the policymakers.

The motivation of this paper is from two policies mentioned above, tax rate and entry cost. Until now, a large amount of literature that utilize political environment when analyzing economic growth use indices such as the democracy index or rule of law. For example, Owen, Videras, and Davis (2009) suggest that, using the degree of law and order, quality of institutions works as a measure to differentiate regimes. Kosack (2003) employs various democracy indices such as Polity index and freedom scales from the Freedom House when demonstrating how democracy affects the effectiveness of development aid on improving the quality of life. However, here I use tax rate and entry cost to entrepreneurship as proxies to political regimes, or in other words, the degree of democracy. Thus, I first modify Eq. 1 into the following equations:

$$g_{it} = \alpha + X'_{it}\beta + u_i + \varepsilon_{it}$$

$$= \alpha + \beta_1 \ln(y_{i,int}) + \beta_2 \ln(k_{it}) + \beta_3 \ln(h_{it}) + \beta_4 \ln(n_{it} + g + \delta)$$

$$+\beta_5 \ln(gc_{it}) + \beta_6 \ln(\tau_{it}) + \beta_7 b_{it} + u_i + \varepsilon_{it}, \tag{2}$$

$$w_{it} = u_i + \varepsilon_{it} \text{ where } u_i \sim iid(0, \sigma_u^2) \text{ and } \varepsilon_{it} \sim iid(0, \sigma_\varepsilon^2)$$

$$\text{for } t = 1, \cdots, T \text{ and } i = 1, \cdots, N; \quad E(X_{is}\varepsilon_{it}) = 0 \ \forall \ s, t. \tag{3}$$

where τ_{it} is the tax rate on revenues in country i for period t and b_{it} is the entry cost to entrepreneurship in country i. To capture the nature of entry costs, I try utilizing a number of indices related to cost of barrier in business. The indices tested in this paper are *Business Freedom Index* (BFREE), *Bureaucracy Cost* (BCOST), *Starting a Business* (STARTB), and *Regulation* (REG). Further details on the data are given in section 4. I first utilize the random-effects GLS regression

model as in Eq. 2, where u_i is the country-specific random effect. It measures the difference between the growth rate of country i and growth rate of the entire world, and is "random" since the specific country is picked from a group of countries. The random-effects model assumes that there is no correlation between the observed variables, X_{it}, and the unobserved variable, u_i. Also, the assumption that u_i is independent of w_{it} and ε_{it} and that w_{it} and ε_{it} are independent of each other is needed, as shown in Eq. 3.

I also make use of the fixed-effect regression as shown in Eq. 4. Here, fixed country effect q_i is introduced to account for the difference in each state's characteristics. The main difference in the fixed-effects model is that it assumes that there is correlation between the observed variables, X_{it}, and the unobserved variable, u_i. In this case, deviation from mean is utilized as in Eq. 5. Then, OLS is used to estimate the coefficients.

$$
\begin{aligned}
g_{it} &= \alpha + q_i + X_{it}^{'}\beta + \varepsilon_{it} \\
&= \alpha + q_i + \beta_1 \ln\big(y_{i,int}\big) + \beta_2 \ln(k_{it}) + \beta_3 \ln(h_{it}) + \beta_4 \ln(n_{it} + g + \delta) \\
&\quad + \beta_5 \ln(gc_{it}) + \beta_5 \ln(\tau_{it}) + \beta_6 b_{it} + \varepsilon_{it} \\
&\quad \text{for } t = 1, \cdots, \text{T and } i = 1, \cdots, \text{N}.
\end{aligned}
\tag{4}
$$

$$
\begin{aligned}
g_{it} - \bar{g}_\iota &= (X_{it} - \bar{X}_\iota)^{'}\beta + (u_i - \bar{u}_\iota) + (\varepsilon_{it} - \bar{\varepsilon}_\iota) \\
&= \ddot{g}_{it} = \ddot{X}_{it}^{'}\beta + \ddot{\varepsilon}_{it}
\end{aligned}
\tag{5}
$$

In both models I first employ tax rate and entry cost as direct determinants of growth rates in order to observe the general implications. Then, tax rate and entry cost are utilized as dummy variables as to separate states into two groups as

mentioned in Acemoglu (2008).

4. Data

The dependent variable is the annual growth rate of real GDP per capita from 1971 to 2010. The independent variables are the log of real GDP per capita for the year before every period, or period t-1, the log of investment rate, the log of annual population growth rate plus 0.05, the log of average years of schooling for ages 15 and up, the log of tax rate, and the bureaucracy cost. Literature on economic growth usually use average values over the 5-year periods such as 1970 to 1975. However, due to lack of data, especially for tax rate and bureaucracy cost, I use annual data for my empirical analysis.

Real GDP per capita for period t-1 measures the difference between initial capital stock among countries. While many studies employ the initial year's income or GDP per capita of each 5-year period, I switch this for the lag of GDP per capita in order to capture the same implications in my yearly analysis. Investment rates are in percentages of GDP. Schooling from Barro-Lee Dataset only provides data in 5-year increments. Thus, I assume that the value for average years of education is constant throughout the next 4 adjacent years. This is a plausible assumption as the education system of states does not go under revolutionary changes in such short terms. Tax rate refers to the tax imposed on income, profits, and capital gains as a percentage of revenues.

While there exists robust dataset of indices that measure democracy and

political freedom, data regarding barrier to entrepreneurship is very limited, and often has a short time span. Thus, I was only able to find four indices that are at least moderately related to entry cost in entrepreneurship. Out of them, *Starting a Business*, *Bureaucracy Cost*, and *Regulation* Indices come from the same source, the Economic Freedom of the World Report by Cato Institute and Fraser Institute. Starting a Business Index is "based on the World Bank's Doing Business data on the amount of time and money it takes to start a new limited-liability business, and countries where it takes loner or is more costly to start a new business are given lower ratings" (Fraser institute, 283). Bureaucracy Cost is "based on the Global Competitiveness Report question that asks about the standards on product/service quality, energy, and other regulations (outside environmental regulations)." (Fraser institute, 283) Ratings of 0-10 are given, where value of 10 indicates that standards are lax or non-existent, while 0 means they are among the world's most stringent states. Regulation is an index that summarizes various criteria related to capital, labor, and business regulations, including Starting a Business and Bureaucracy Cost mentioned above, also using scales from 0 to 10. Business Freedom Index is from the Index of Economic Freedom published by the Heritage Foundation. Here, "Business Freedom is a quantitative measure of the ability to start, operate, and close a business that represents the overall burden of regulation as well as the efficiency of government in the regulatory process" (Heritage Foundation, 458). Values between 0 and 100 are assigned, where countries with freest business environment are given 100.

Because data on tax rates, Starting a Business, Bureaucracy Costs,

Regulation, and Business Freedom index suffers from deficiency, I employ unbalanced panel data for my analysis. My observations range around 900 to 1300 from 90 to 110 countries, depending on the data I use. Table 1 provides descriptive statistics and the data sources.

Table 1 Descriptive Statistics

Variable	Obs.	Mean	SD	Description	Data Source
Growth	6916	2.03	7.31	Annual growth rate of real GDP per capita (chained)	PWT 7.1
lnINTGDP	6758	8.40	1.30	Log of initial real GDP per capita (chained)	PWT 7.1
lnINV	6946	3.02	0.56	Log of investment rate (% of GDP)	PWT 7.1
lnSCHOOL	5718	1.67	0.66	Log of average years of schooling for ages 15 and up	Barro-Lee Educational Attainment Dataset
ln(n+g+d)	7560	0.07	0.02	Log of population growth + technology growth + depreciation rate	World Bank; g+d = 0.05
lnGOV	6907	2.31	0.63	Log of government consumption share of real GDP per capita	PWT 7.1
lnTAX	1617	2.87	0.81	Log of tax rate on income, profits, and capital gains (% of revenue)	World Bank
BCOST	1379	5.40	1.77	5Cii. Index of Bureaucracy Costs	Economic Freedom of the World Report
STARTB	1479	7.55	1.90	5Ciii. Index of Starting a Business	Economic Freedom of the World Report
REG	3746	5.60	1.36	5. Regulation	Economic Freedom of the World Report
lnBFREE	2244	4.13	0.26	Business Freedom Index	Index of Economic Freedom
DEM				Democracy Index	Freedom in the World

5. Empirical Analysis: Results and Discussion

5.1 Growth regression with tax rate and entry cost

In this section, I discuss the results of the regression based on the model described above, and discuss the implication of the results. First, I make use of the GLS random-effects and fixed-effects (within) regression models in order to account for the fixed effects of each country. Then I include tax rates and test each index for entry barrier to entrepreneurship. Lastly, I alter the tax rate and entry cost variables into dummy variables to divide countries into two types, democracy and oligarchy.

Table 2 shows the growth regression results for model with tax rate and entry cost using random-effects GLS regression. The main difference here from the fixed-effects model is that "in a random effects model, the unobserved variables are assumed to be uncorrelated with (or, more strongly, statistically independent of) all the observed variables" (Allison, 2). Some show significance in the model, but certain variables such as tax rate and Starting a Business index loses significance altogether.

However, if we take a look at the correlation, it is easy to conclude that fixed-effects model is a better fit for my panel data. Since the correlation between the unobserved variables and all the other observed variables is high (with a value of -0.9589 in the case of regression including Business Freedom Index; for all other regressions, this value is constantly very high, ranging between -0.88 and -0.99.), I employ the fixed-effects regression from now on.

Table 2 Growth Regression Results Using Random-Effects GLS Regression

VARIABLES	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth
lnINTGDP	-1.244***	-0.746**	-1.423***	-1.194***	-1.447***
	(0.148)	(0.292)	(0.265)	(0.262)	(0.267)
lnINV	2.185***	3.897***	5.004***	3.838***	3.611***
	(0.221)	(0.492)	(0.550)	(0.527)	(0.447)
lnSCHOOL	0.990***	0.923	1.351	1.127	1.633**
	(0.258)	(0.779)	(0.851)	(0.823)	(0.771)
ln(n+g+d)	-0.290**	-0.424*	-0.543***	-0.433**	-0.380*
	(0.143)	(0.231)	(0.209)	(0.213)	(0.212)
lnGOV	-1.481***	-1.021*	-0.999*	-1.138**	-0.414
	(0.259)	(0.567)	(0.522)	(0.531)	(0.507)
lnTAX		0.0985	0.167	-0.0654	-0.0876
		(0.301)	(0.287)	(0.295)	(0.289)
lnBFREE		-3.171***			
		(1.036)			
BCOST			0.257***		
			(0.0626)		
STARTB				-0.0781	
				(0.0814)	
REG					0.272*
					(0.156)
Constant	7.596***	10.36**	-3.127	2.002	0.0976
	(1.421)	(4.268)	(2.872)	(2.754)	(2.681)
Observations	4,853	988	808	840	1,173
Number of Countries	137	100	84	87	98

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5.1.1 Interpretation for fundamental variables

Table 3 presents the growth regression results for model with tax rate and entry cost. First regression result is done with the basic neoclassical model with only fundamental variables in order to compare and contrast with the other results. Real GDP per capita in period t-1, investment, and average years of schooling is significant at 1% level with same signs in all analysis. The minus sign of real GDP

per capita in period shows that growth rate slows down as countries shift from developing to developed countries. Increase in investment and years of schooling boosts growth, as they imply the rise in the stock of capital and the quality of labor. Increase in population, though it varies in its significance level, can be harmful for growth as it dilutes the capital stock in a country. This would decrease the amount of capital available for each worker and thus lower the steady-state level of output per worker. The signs all appear consistent with the neoclassical growth model.

5.1.2 Tax rates and government consumption

What is interesting here are the relationships of tax rates and government consumption with economic growth. From Table 3, it is possible to notice that government consumption and tax rate show significantly negative and positive correlation respectively. The negative relationship between level of government consumption and the growth rate of GDP are suggested in many literature such as Barro (1990), Grier and Tullock (1987), and Landau (1983). The data used here is also similar to these studies in that I also hold constant a measure of investment in education through average years of schooling; this is due to the fact that consumption on education and defense is often considered as an economy's broadly defined investment. This result can be traced back to the fact that governments do not usually act in the most efficient way in the economic sense. In other words, it is an indication that governments do choose less efficient measures which lead to lower productivity. This phenomenon stems from various underlying

Table 3 Growth regression results for model with tax rate and entry cost using fixed-effect regression

VARIABLES	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth
lnINTGDP	-4.241***	-9.017***	-9.116***	-11.02***	-9.181***
	(0.296)	(1.217)	(1.273)	(1.288)	(0.912)
lnINV	2.839***	4.580***	7.185***	4.217***	4.020***
	(0.266)	(0.664)	(0.902)	(0.748)	(0.554)
lnSCHOOL	1.207***	8.356***	11.89***	10.86***	5.721***
	(0.307)	(2.239)	(2.297)	(2.411)	(1.502)
ln(n+g+d)	-0.565***	-1.059***	-1.113***	-0.698*	-0.182
	(0.177)	(0.352)	(0.366)	(0.361)	(0.315)
lnGOV	-3.234***	-6.294***	-6.161***	-6.931***	-2.799***
	(0.368)	(1.095)	(1.505)	(1.482)	(1.008)
lnTAX		0.993*	1.219**	1.826***	1.101**
		(0.539)	(0.594)	(0.655)	(0.446)
lnBFREE		-2.548**			
		(1.179)			
BCOST			0.222***		
			(0.0681)		
STARTB				-0.0127	
				(0.104)	
REG					0.610***
					(0.204)
Constant	34.32***	72.37***	46.03***	75.34***	58.18***
	(2.623)	(10.39)	(11.15)	(10.82)	(7.715)
Observations	4,853	988	808	840	1,173
R-squared	0.070	0.128	0.197	0.148	0.146
Number of Countries	137	100	84	87	98

Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

reasons. Government consumption is mostly maintained through tax revenues. Thus, in order to increase government consumption, taxes might rise, leading to lower tax base. This causes some potential transactions between buyers and sellers to not take place, resulting in inefficiency. Sometimes the government intentionally embraces actions that impede economic growth but are probably utility-maximizing for the whole society. Promoting the arts and reducing pollution are

good examples. These actions could also come from an individual's utility maximization, such as corruption and kleptocracy, which would be deleterious for both economic growth and social well-being. Either way, a rise in government consumption has the possibility to induce a decrease in productivity.

Then what does tax rate tell us? It might seem strange that tax rate and government consumption are both used as independent variables in the same regression. After all, does not government need tax revenues in order to consume goods, which lead to correlation between the two variables? I believe the answer lies in the specific data that I choose here. If we take a look at the tax rate, the variable is significant at 1% with a positive sign. Thus, increase in tax rates is associated with the increase in growth rates. The tax rate here is actually the percentage of income, profit, and capital gains, or, simply put, revenue. Therefore, higher tax rates of this definition would naturally lead to reduced gaps between classes or less inequality in a society. Higher tax rates also often lead to pressures for higher redistribution in a society, either through lump-sum distributions as mentioned in Acemoglu (2008) or, more commonly, through welfare policies such as unemployment compensation and minimum wage system. This is further supported by the data. For instance, "in the United States, such transfers now amount to 12.2% of GDP, and their share of GDP has more than doubled since the 1960s" (Weil, 351).

5.1.3 Inequality and growth

The relationship between inequality and growth is somewhat more complicated. There exist various channels through which inequality can effect economic growth in a positive or negative way, but currently available data are unable to empirically define the relationship unquestionably. My empirical results here are in accord with a number of economists who claim that inequality is on average harmful for growth (e.g., Persson and Tabellini 1991, Alesina and Rodrik 1991). This is due to the fact that income inequality "leads to policies that do not protect property rights and do not allow full private appropriation of returns from investment" (Persson and Tabellini, 40). It can also be explained through majority voting. As income gap widens, the difference between the income of the median voter and the average income increases. Then the median voter is more likely to choose policies that favor redistribution, which is inefficient from the view of economic growth. Social unrest expressed by crime or political instability as different groups compete for power is another factor that applies pressure for more redistribution.

5.1.4 Entry barrier to entrepreneurship

Results for various measures of entry barrier to entrepreneurship also appear in Table 3. According to Acemoglu (2008), high entry cost for new entrepreneurs suppress the economic growth of a country since those with high abilities cannot make full use of their entrepreneurial skills. However, the

regression results here vary according to the index I choose. The four indices are similar in that larger values refer to a freer environment for entrepreneurship with less regulations and costs. Thus, if we assume that the theory in Acemoglu (2008) is correct, economic growth should be positively related to the economic freedom indices. Bureaucracy Cost brings similar results to the table as Starting a Business Index and the Regulation Index: higher values denote low entry barrier to entrepreneurship, thus the positive sign with significance at 1% or 5% level. Business Freedom, on the other hand, has a negative relationship with growth rates. Therefore, this suggests that countries with less freedom in entrepreneurship tend to have high growth rates, which is against my findings with other three indices.

I believe this contrary result is due to the definition of the Business Freedom index. The Business Freedom index is composed of 10 factors that are all weighted equally. Among them, some criteria are questionable whether they represent the exact meaning of "entry barrier" in the context of Acemoglu (2008). For instance, minimum capital requirement or the procedure of obtaining a license are hard to be considered as 'pure waste' if they reflect certain measures necessary for financial stability in businesses or processes for evaluation of suitable candidates. Since absolute average values are used for the index, a country with outstanding scores in 9 areas could receive a significantly lower ranking according to the score of the tenth criterion. For example, "Canada receives scores of 100 in nine of the 10 factors, but the 14 licensing procedures required by the government equate to a score of 64.5 for that factor" (2012 Index of Economic Freedom, 459). Hence, this might be the culprit of the negative relationship between BFREE and

economic growth.

5.2 Tax rate and entry cost as dummy variables

Next, I try to employ tax rate and entry cost as dummy variables as to divide countries into two groups, democracy and oligarchy, as mentioned in Acemoglu (2008). For the countries with available data, I define those with tax rate and entry barrier indices values above median as democratic societies. States with values under median are categorized as oligarchic societies. For countries with data ranging across the median, I count the number of observations above and under median respectively and assign the type of regime closer to that specific country. For those with exactly same number of observations for democracy and oligarchy, I include these countries in both groups.

Since the correlation between the unobserved variables and all the other observed variables is also high in this case, I again employ fixed-effects regression. The results are present in Table 4. While some variables such as Bureaucracy Cost dummy in (2) and tax rate dummy in (4) lose significance altogether, most variables remain significant and consistent with the result in Table 4.

5.3 Tax rate and entry barrier as a single index

Next, I try to develop a single index using tax rate and entry barrier. I sort countries with high (meaning above median) tax rate and high values for indices representing entry cost as democracy. However, not many nations have all its time-series data above or below the median. Therefore, for countries with more than 70% of its data above the median, I label them as democracy. In Table 5, Dum1 represents the criteria set by tax rate and Business Freedom index. Dum2, Dum3, and Dum4 represent tax rate combined with Bureaucracy Cost, Starting a Business, and Regulation respectively. The result loses even more significance as countries are sorted into two groups.

However, it is possible that the loss of significance in the dummy variables is from inappropriate criteria in dividing countries into two groups using tax rate and indices that represent entry cost. Thus, I try another method in creating dummy variables for differences in political regimes. This time, I average the tax rates and indices of each country and observe if the value is over the median, indicating democracy, or under the median, referring to oligarchy. Then again, I combine tax rate with Business Freedom, Bureaucracy Cost, Starting a Business, and Regulation Index respectively. I label them as dum21, dum22, dum23, and dum24 in Table 6, and they all work as dummies for democratic societies.

Table 4 Growth regression results for model with tax rate dummy and entry cost dummies (fixed-effects regression)

VARIABLES	(1) Growth	(2) Growth	(3) Growth	(4) Growth
lnINTGDP	-9.071***	-9.407***	-10.71***	-8.552***
	(1.194)	(1.247)	(1.295)	(0.898)
lnINV	4.605***	7.550***	4.434***	4.350***
	(0.664)	(0.901)	(0.746)	(0.547)
lnSCHOOL	8.566***	11.87***	11.40***	6.684***
	(2.258)	(2.314)	(2.343)	(1.521)
ln(n+g+d)	-1.036***	-1.102***	-0.735**	-0.366
	(0.351)	(0.369)	(0.362)	(0.313)
lnGOV	-6.240***	-5.874***	-7.231***	-3.122***
	(1.100)	(1.512)	(1.481)	(1.002)
TAXdum	0.623	0.399	0.586	0.126
	(0.496)	(0.499)	(0.489)	(0.413)
BFREEdum	-0.190			
	(0.531)			
BCOSTdum		0.495*		
		(0.266)		
STARTBdum			0.0413	
			(0.355)	
REGdum				0.686*
				(0.384)
Constant	64.28***	51.57***	76.59***	57.22***
	(9.685)	(11.05)	(11.13)	(7.817)
Observations	988	808	840	1,173
R-squared	0.122	0.184	0.141	0.137
Number of Countries	100	84	87	98

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

In this case, out of two measures for democracy, countries that satisfy only one of them are not included in either democracy or oligarchy. As an effort to further include these nations, this time I utilize all five criteria available for tax rate and entry barrier, and see how many measures of democracy each country satisfies. For the dummy variable labeled dumall1, I use a narrow definition and only

include countries that satisfy at least 3 out of 5 criteria for either democratic or oligarchic society. In dumall2, I employ a broader definition, including nations that satisfy more measures for a group, although the number may be smaller than 3. This method is implemented since data of tax rate and indices for entry barrier might not all exist for a country. For example, the available data for Suriname is Business Freedom and Regulation indices; thus, it cannot be included in any group by the standards given in dumall1. However, both of these two indices indicate that Suriname is an oligarchic society; therefore, I include Suriname in the oligarchy group in dumall2.

The results are in Table 6. Here, the basic neoclassical variables mostly stay consistent with the results shown in the earlier part of the chapter. The sign of dummy variables are all positive, indicating that democracy is positively correlated with higher economic growth. Therefore, it is possible to conclude that this criterion for political regimes is better than the previous one. Also, Bureaucracy Cost and employment of all five dataset is most efficient in measuring democracy, as implied by the significance of dum22, dumall1, and dumall2.

Table 5 Growth regression with dummy variable of tax rate and entry barrier combined

VARIABLES	(1) grth1	(2) grth1	(3) grth1	(4) grth1
lnINTGDP	-0.617***	-0.569***	-0.590***	-0.660***
	(0.0787)	(0.0849)	(0.0777)	(0.0765)
lnINV	1.855***	2.310***	2.325***	2.419***
	(0.160)	(0.182)	(0.169)	(0.164)
lnSCHOOL	0.830***	0.333	0.550***	0.525***
	(0.203)	(0.220)	(0.194)	(0.190)
ln(n+g+d)	-0.211*	-0.253**	-0.365***	-0.348***
	(0.110)	(0.106)	(0.103)	(0.0999)
lnGOV	0.0568	-0.308**	-0.469***	-0.382***
	(0.149)	(0.149)	(0.138)	(0.138)
DUM1	0.585***			
	(0.227)			
DUM2		0.354		
		(0.227)		
DUM3			0.373	
			(0.264)	
DUM4				1.135***
				(0.219)
Observations	4,364	3,679	3,818	3,950
R-squared	0.137	0.173	0.167	0.176

Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6 Growth regression with dummy variable of tax rate and entry barrier combined using country average values

VARIABLES	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth	(6) Growth
lnINTGDP	-0.644***	-0.719***	-0.629***	-0.666***	-0.581***	-0.540***
	(0.0920)	(0.104)	(0.0995)	(0.0960)	(0.0767)	(0.0765)
lnINV	2.185***	2.803***	2.760***	2.232***	1.943***	1.766***
	(0.180)	(0.240)	(0.216)	(0.216)	(0.162)	(0.156)
lnSCHOOL	0.644***	0.501*	0.673***	0.797***	0.595***	0.752***
	(0.221)	(0.280)	(0.242)	(0.238)	(0.196)	(0.201)
ln(n+g+d)	-0.286**	-0.0985	-0.533***	-0.229*	-0.316***	-0.193*
	(0.126)	(0.123)	(0.135)	(0.133)	(0.104)	(0.111)
lnGOV	-0.198	-0.716***	-1.192***	-0.350*	-0.113	-0.0884
	(0.196)	(0.212)	(0.198)	(0.197)	(0.140)	(0.146)
DUM21	0.480					
	(0.311)					
DUM22		0.857***				
		(0.265)				
DUM23			0.494**			
			(0.245)			
DUM24				0.540*		
				(0.276)		
DUMALL1					0.730***	
					(0.194)	
DUMALL2						0.532***
						(0.204)
Observations	2,736	2,023	2,347	2,646	4,164	4,552
R-squared	0.182	0.220	0.180	0.150	0.150	0.126

Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

5.4 Multicollinearity

The results seem satisfactory enough, with the signs of coefficients being consistent throughout the change in the number of samples and variables. Nonetheless, multicollinearity has to be checked in order to safely assure the relationship between the growth rate and the explanatory variables. Here, I use three methods to check if multicollinearity exists.

First, I look at the bivariate correlation between the independent variables. This is shown in Table 7. However, since this alone is not enough to claim there is no multicollinearity, I also examine the tolerance or the vector inflation factor (VIF). VIF is a measure that quantifies the magnitude of multicollinearity in an OLS regression. The square root value of VIF indicates how large the standard error is, in contrast with what it would be if the variable were uncorrelated with other explanatory variables in the model. Tolerance is the inverse of VIF. A common rule of thumb is that multicollinearity should be suspected if VIF has a value over 10 (or equivalently, tolerances of 0.1 or less), although some, like Allison, worries about multicollinearity if VIF is larger than 2.5 and the tolerance is under 0.4. I present the values for the VIF and the tolerance in Table 8. Lastly, I look at the correlations of the estimated coefficients, since high correlations between coefficients indicate the possibility of multicollinearity. This is shown in Table 9. From these three methods, I conclude that there is not much room for multicollinearity in the model.

Table 7 Correlation between explanatory variables

7.1 Model with Business Freedom Index

	lnINTGDP	lnINV	lnSCHOOL	ln(n+g+d)	lnGOV	lnTAX	lnBFREE
lnINTGDP	1.0000						
lnINV	0.3798	1.0000					
lnSCHOOL	0.7456	0.2523	1.0000				
ln(n+g+d)	-0.5200	-0.1886	-0.4836	1.0000			
lnGOV	-0.3914	-0.1104	-0.3620	0.1718	1.0000		
lnTAX	0.1830	0.0873	0.2346	-0.1340	-0.1121	1.0000	
lnBFREE	0.7144	0.2967	0.5560	-0.3148	-0.3282	0.2174	1.0000

7.2 Model with Bureaucracy Cost Index

	lnINTGDP	lnINV	lnSCHOOL	ln(n+g+d)	lnGOV	lnTAX	BCOST
lnINTGDP	1.0000						
lnINV	0.2511	1.0000					
lnSCHOOL	0.7403	0.1623	1.0000				
ln(n+g+d)	-0.5029	-0.0717	-0.4196	1.0000			
lnGOV	-0.3661	-0.0784	-0.3444	0.1127	1.0000		
lnTAX	0.1511	-0.0192	0.2209	-0.0259	-0.0492	1.0000	
BCOST	0.1032	0.0005	0.0350	-0.0638	-0.0317	0.0136	1.0000

7.3 Model with Starting a Business Index

	lnINTGDP	lnINV	lnSCHOOL	ln(n+g+d)	lnGOV	lnTAX	STARTB
lnINTGDP	1.0000						
lnINV	0.2901	1.0000					
lnSCHOOL	0.7569	0.2122	1.0000				
ln(n+g+d)	-0.5288	-0.1345	-0.4562	1.0000			
lnGOV	-0.3874	-0.0575	-0.3661	0.1574	1.0000		
lnTAX	0.1714	0.0256	0.2692	-0.0392	-0.1082	1.0000	
STARTB	0.3112	0.2307	0.3402	-0.0633	-0.0925	0.1859	1.0000

7.4 Model with Regulation Index

	lnINTGDP	lnINV	lnSCHOOL	ln(n+g+d)	lnGOV	lnTAX	REG
lnINTGDP	1.0000						
lnINV	0.3775	1.0000					
lnSCHOOL	0.7501	0.2937	1.0000				
ln(n+g+d)	-0.5224	-0.1580	-0.4943	1.0000			
lnGOV	-0.4234	-0.1789	-0.3765	0.2047	1.0000		
lnTAX	0.1131	-0.0163	0.2484	-0.1632	-0.0762	1.0000	
REG	0.5201	0.2956	0.5286	-0.2166	-0.3118	0.2330	1.0000

Table 8 Vector inflation factors (VIFs) and tolerances

8.1. Model with Business Freedom Index

Variable	VIF	Tolerance
lnINTGDP	3.74	0.267141
lnSCHOOL	2.41	0.414935
lnBFREE	2.11	0.473210
ln(n+g+d)	1.43	0.698224
lnGOV	1.21	0.827236
lnINV	1.18	0.850085
lnTAX	1.08	0.929167
Mean VIF	1.88	

8.2. Model with Bureaucracy Cost Index

Variable	VIF	Tolerance
lnINTGDP	2.70	0.370253
lnSCHOOL	2.34	0.426792
ln(n+g+d)	1.38	0.726933
lnGOV	1.18	0.844346
lnINV	1.08	0.927780
lnTAX	1.06	0.941210
BCOST	1.02	0.984377
Mean VIF	1.54	

8.3. Model with Starting a Business Index

Variable	VIF	Tolerance
lnINTGDP	2.86	0.349649
lnSCHOOL	2.60	0.384424
ln(n+g+d)	1.45	0.689932
STARTB	1.21	0.826025
lnGOV	1.21	0.826725
lnINV	1.13	0.888639
lnTAX	1.10	0.907547
Mean VIF	1.65	

8.4. Model with Regulation Index

Variable	VIF	Tolerance
lnINTGDP	2.92	0.342301
lnSCHOOL	2.65	0.377666
REG	1.56	0.639276
ln(n+g+d)	1.46	0.683520
lnGOV	1.24	0.804312
lnINV	1.20	0.835956
lnTAX	1.13	0.887634
Mean VIF	1.74	

Table 9 Correlations between the estimated coefficients

9.1 Fixed-effects model with Business Freedom Index

e(V)	lnINTGDP	lnINV	lnSCHOOL	ln(n+g+d)	lnGOV	lnTAX	lnBFREE
lnINTGDP	1.0000						
lnINV	-0.0573	1.0000					
lnSCHOOL	-0.5381	-0.1003	1.0000				
ln(n+g+d)	0.0687	-0.0972	0.0773	1.0000			
lnGOV	0.1954	0.0225	-0.1245	0.1014	1.0000		
lnTAX	-0.1915	-0.0768	-0.0093	0.0735	0.0260	1.0000	
lnBFREE	-0.1255	-0.0309	0.1158	0.0798	0.0176	-0.0482	1.0000

9.2 Fixed-effects model with Bureaucracy Cost Index

e(V)	lnINTGDP	lnINV	lnSCHOOL	ln(n+g+d)	lnGOV	lnTAX	BCOST
lnINTGDP	1.0000						
lnINV	-0.0230	1.0000					
lnSCHOOL	-0.4875	-0.0318	1.0000				
ln(n+g+d)	0.0381	-0.0552	0.0385	1.0000			
lnGOV	0.1209	0.2422	-0.1309	0.0765	1.0000		
lnTAX	-0.1698	-0.1394	-0.1165	0.0441	0.0311	1.0000	
BCOST	0.2716	-0.0274	0.1088	-0.0932	-0.0786	-0.0284	1.0000

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9.3 Fixed-effects model with Starting a Business Index

e(V)	lnINTGDP	lnINV	lnSCHOOL	ln(n+g+d)	lnGOV	lnTAX	STARTB
lnINTGDP	1.0000						
lnINV	-0.1238	1.0000					
lnSCHOOL	-0.3564	-0.0050	1.0000				
ln(n+g+d)	0.0474	0.0004	0.0471	1.0000			
lnGOV	0.0968	0.1088	-0.1449	0.0981	1.0000		
lnTAX	-0.1508	-0.1261	-0.1407	0.0466	0.0854	1.0000	
STARTB	-0.3396	-0.0139	-0.3068	0.0127	0.0605	0.0044	1.0000

9.4 Fixed-effects model with Regulation Index

e(V)	lnINTGDP	lnINV	lnSCHOOL	ln(n+g+d)	lnGOV	lnTAX	REG
lnINTGDP	1.0000						
lnINV	0.0069	1.0000					
lnSCHOOL	-0.3654	-0.0373	1.0000				
ln(n+g+d)	0.0672	-0.0694	0.0901	1.0000			
lnGOV	0.0812	0.0934	-0.0147	-0.0163	1.0000		
lnTAX	-0.0862	-0.0519	-0.1168	0.0934	-0.0632	1.0000	
REG	-0.2030	-0.2022	-0.3269	0.1243	0.1458	-0.0304	1.0000

5.5 Further analysis on the relationship between democracy and growth

The model that I utilize above has a possibility to provoke certain problems since there is no consensus on the relationship between democracy and growth. Empirical results show that higher levels of democracy may or may not be beneficial to economic growth. As a result, some like Barro(1996) suggest that democracy boosts growth in the earlier stages of political development, but becomes weakly negative as initial levels of democracy are enhanced. This is due to the fact that democracy is sort of a luxury good. Political freedom is thus available to the rich countries that can afford the decrease in economic growth.

Keeping this relationship in mind, to analyze the effect of tax rates and entry barriers in detail I add interaction terms to my previous model. Here, I add democracy (noted as DEM) to control for various levels of political freedom. Thus, additional terms of democracy, democracy*tax rate, and democracy*entry barrier appear in the adjusted model. I employ the democracy data from the Freedom House; the index is scaled from 1 to 7, with 7 implying the freest political environment. I also utilize fixed-effects regression here since the correlation between the observed and unobserved variables is high. The regression results are shown in Table 10.

Table 10 Fixed-effects regression with interaction terms

VARIABLES	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth
lnINTGDP	-4.485***	-8.475***	-7.491***	-10.53***	-9.413***
	(0.317)	(1.275)	(1.305)	(1.317)	(0.926)
lnINV	2.638***	4.226***	8.084***	4.192***	3.982***
	(0.276)	(0.683)	(0.891)	(0.740)	(0.556)
lnSCHOOL	1.163***	6.492***	7.684***	8.093***	4.905***
	(0.335)	(2.292)	(2.319)	(2.461)	(1.510)
ln(n+g+d)	-0.555***	-1.093***	-1.066***	-0.700*	-0.216
	(0.184)	(0.352)	(0.356)	(0.357)	(0.314)
lnGOV	-3.410***	-7.477***	-6.514***	-7.206***	-3.028***
	(0.391)	(1.384)	(1.491)	(1.488)	(1.014)
lnTAX		3.154***	4.023***	3.760***	3.005***
		(1.154)	(1.189)	(1.202)	(0.973)
DEM	-0.356***	-0.733	2.715***	-0.163	0.159
	(0.0961)	(2.856)	(1.030)	(1.051)	(0.895)
lnTAX*DEM		-0.541**	-0.743***	-0.583**	-0.452**
		(0.262)	(0.276)	(0.290)	(0.222)
lnBFREE		-3.701*			
		(2.240)			
lnBFREE* DEM		0.410			
		(0.646)			
BCOST			0.680***		
			(0.106)		
BCOST* DEM			-0.219***		
			(0.0425)		
STARTB				-0.402***	
				(0.150)	
STARTB* DEM				0.188***	
				(0.0587)	
REG					0.155
					(0.385)
REG*DEM					0.108
					(0.0888)
Constant	38.79***	74.90***	28.06**	75.37***	60.99***
	(2.844)	(13.07)	(13.00)	(12.61)	(9.206)
Observations	4,571	972	799	831	1,164
R-squared	0.073	0.141	0.245	0.172	0.158
Number of Countries	133	98	83	86	97

Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

The first regression is done with the basic neoclassical model, but with the democracy index. It shows that democracy is weakly negative with economic growth, which is consistent with Barro(1996)'s results. Next, interaction terms are introduced into the model. Tax rate shows a steady relationship with economic growth regardless of the measures I use for entry barrier. The coefficient for tax rate alone is positive, while the interaction term of democracy and tax rate is negative. This implies that although increase in tax rate is positively correlated to growth in the early stages of democracy, it loses its effect and even becomes negatively correlated to growth as a country gains more political freedom.

To see this continuous by continuous interaction more closely, I calculate the effect of tax rate on growth when democracy is held constant. Table 11 to 14 shows the relationship between tax rate and economic growth under different levels of political freedom. As a country becomes more democratic, tax rate loses its significance and the sign also becomes negative. The linear growth prediction is graphed in Figure 1, 2, 3, and 4. For certain levels of democracy that loses significance, thinner lines are used. Regardless of what measure I employ for entry barriers, tax rate shows a steady positive correlation with economic growth.

Table 11 Effect of tax rate on growth when democracy is held constant: model with Business Freedom Index

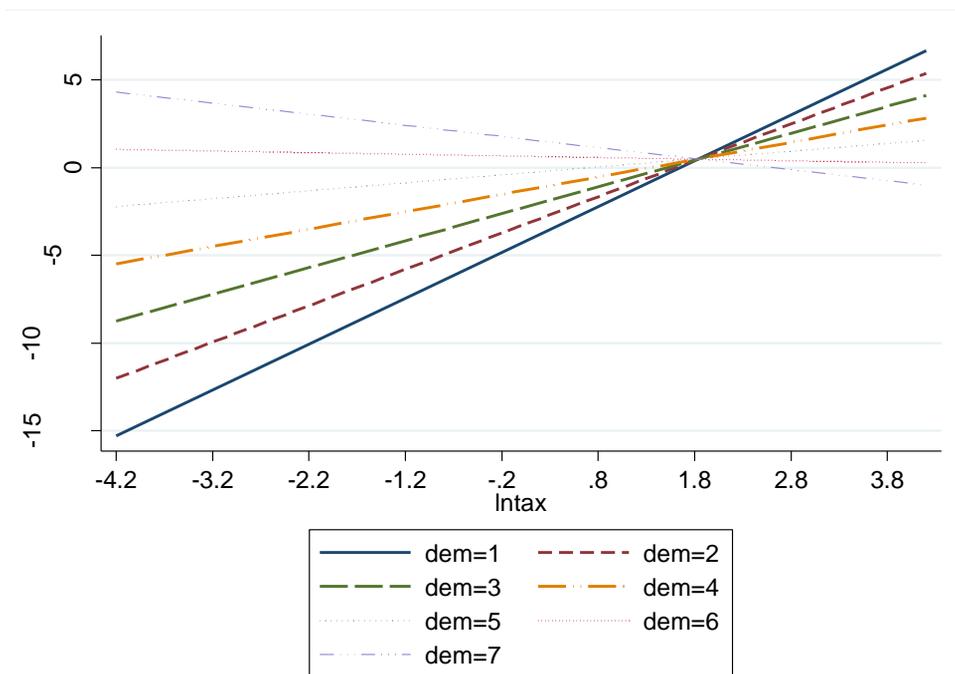|	dy/dx	Std. Err	z	p>|z|	95% Conf. Interval	
lnTAX at						
DEM=1	2.612757	.9314299	2.81	0.005	.7871878	4.438326
=2	2.071936	.7345078	2.82	0.005	.6323272	3.511545
=3	1.531115	.5904717	2.59	0.010	.373812	2.688419
=4	.9902945	.5431639	1.82	0.068	-.0742872	2.054876
=5	.4494737	.6153147	0.73	0.465	-.756521	1.655468
=6	-.0913471	.7742173	-0.12	0.906	-1.608785	1.426091
=7	-.6321679	.9784823	-0.65	0.518	-2.549958	1.285622

Figure 1 Linear prediction of growth on tax rate for different states of democracy: model with Business Freedom Index

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Table 12 Effect of tax rate on growth when democracy is held constant: model with Bureaucracy Cost

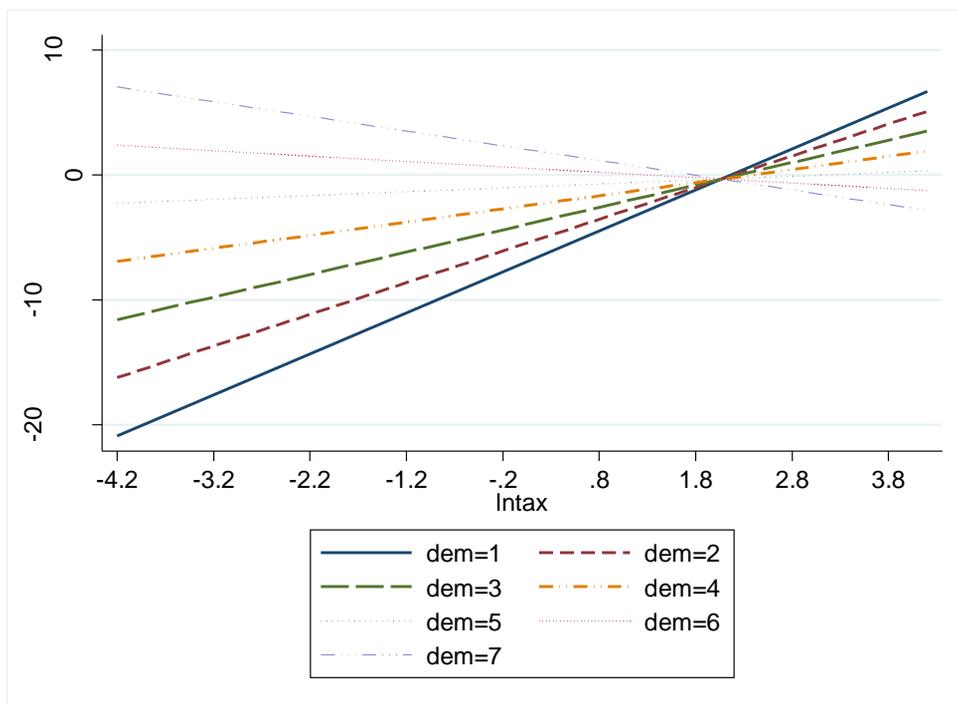|	dy/dx	Std. Err	z	p>|z|	95% Conf. Interval	
lnTAX at						
DEM=1	3.279944	.9570773	3.43	0.001	1.404107	5.155781
=2	2.537268	.7558925	3.36	0.001	1.055746	4.01879
=3	1.794591	.6158252	2.91	0.004	.5875955	3.001586
=4	1.051914	.582751	1.81	0.071	-.0902569	2.194085
=5	.3092374	.6726422	0.46	0.646	-1.009117	1.627592
=6	-.4334394	.8472231	-0.51	0.609	-2.093966	1.227087
=7	-1.176116	1.065653	-1.10	0.270	-3.264758	.9125262

Figure 2 Linear prediction of growth on tax rate for different states of democracy: model with Bureaucracy Cost

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Table 13 Effect of tax rate on growth when democracy is held constant: model with Starting a Business Index

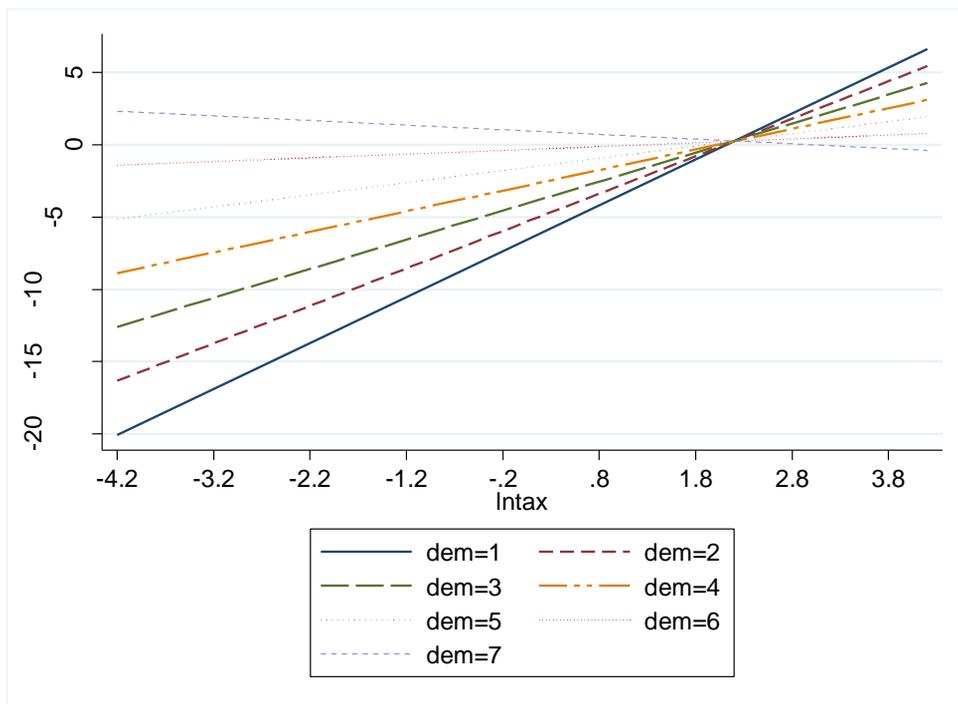|	dy/dx	Std. Err	z	p>|z|	95% Conf. Interval	
lnTAX at						
DEM=1	3.176673	.9722298	3.27	0.001	1.271137	5.082208
=2	2.593419	.7837922	3.31	0.001	1.057215	4.129624
=3	2.010165	.6722069	2.99	0.003	.6926642	3.327667
=4	1.426912	.6766286	2.11	0.035	.1007441	2.753079
=5	.843658	.7951244	1.06	0.289	-.7147572	2.402073
=6	.2604042	.9874471	0.26	0.792	-1.674956	2.195765
=7	-.3228495	1.219144	-0.26	0.791	-2.712329	2.06663

Figure 3 Linear prediction of growth on tax rate for different states of democracy: model with Starting a Business Index

Table 14 Effect of tax rate on growth when democracy is held constant: model with Regulation Index

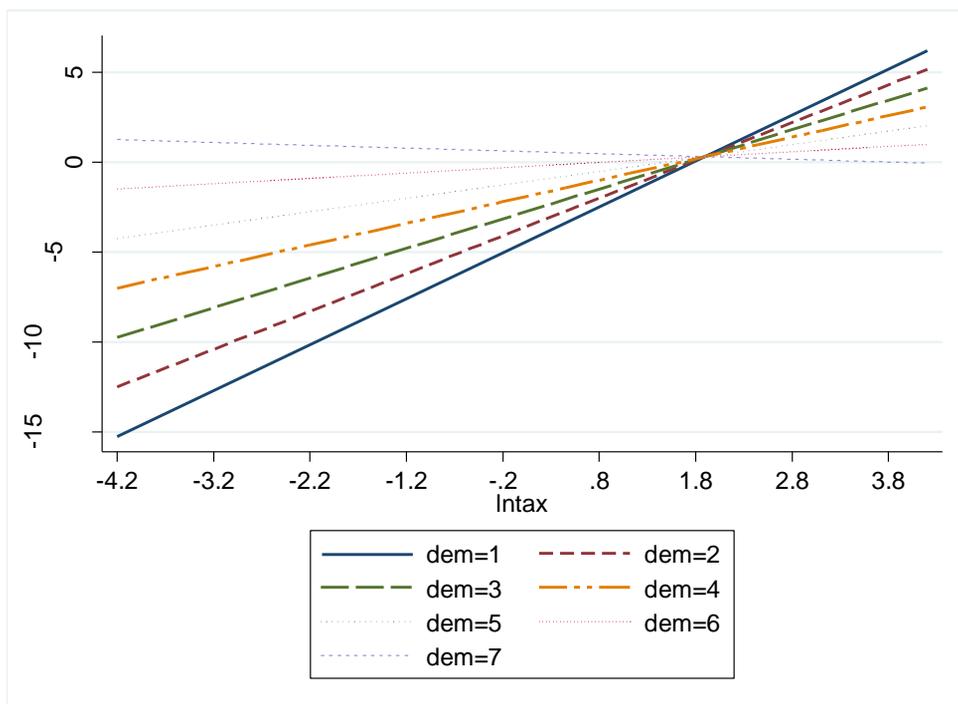|	dy/dx	Std. Err	z	p>|z|	95% Conf. Interval	
lnTAX at						
DEM=1	2.553344	.7825954	3.26	0.001	1.019485	4.087203
=2	2.101836	.6135127	3.43	0.001	.8993734	3.304299
=3	1.650328	.4891942	3.37	0.001	.691525	2.609131
=4	1.19882	.4485477	2.67	0.008	.3196825	2.077957
=5	.7473117	.5119083	1.46	0.144	-.2560102	1.750634
=6	.2958036	.64952	0.46	0.649	-.9772321	1.568839
=7	-.1557046	.8250292	-0.19	0.850	-1.772732	1.461323

Figure 4 Linear prediction of growth on tax rate for different states of democracy: model with Regulation Index

While the results are quite straightforward for tax rates, it is not so simple for entry barriers. From the regression results in Table 10, it is easy to see that the interaction terms for Business Freedom and Regulation loses significance. Therefore, I concentrate on the models that employ Bureaucracy Cost and Starting a Business Index. However, since they show different signs, I also look at the values of coefficients for entry barriers under certain fixed levels of democracy. These results are shown in Table 15 and 16 respectively.

For Bureaucracy Cost, its effect is positive for nations with low levels of political freedom and negative for those with much political freedom. In other words, a decrease in the cost occurred by bureaucracy is beneficial economics growth in less democratic societies. However, as a country becomes more democratic, further improvement in bureaucracy costs is not as beneficial as before, even decreasing growth rates. I believe this is due to the fact that bureaucracy cost becomes inevitable in certain areas as a country develops. For example, protecting the environment is also a luxury good since the foremost goal for developing countries is high economic growth. However, as other interests outside growth are being focused, certain measures are taken to protect these rights, which could often contradict with economic growth.

In the case of Starting a Business Index, its effect is mostly positive for economic growth, except for countries with the lowest levels of democracy (DEM=1). Thus, less time and cost required to start a business is roughly beneficial to growth, even for countries with high levels of political freedom. This is mostly consistent with my theory throughout this paper.

Table 15 Effect of Bureaucracy Cost on growth when democracy is held constant

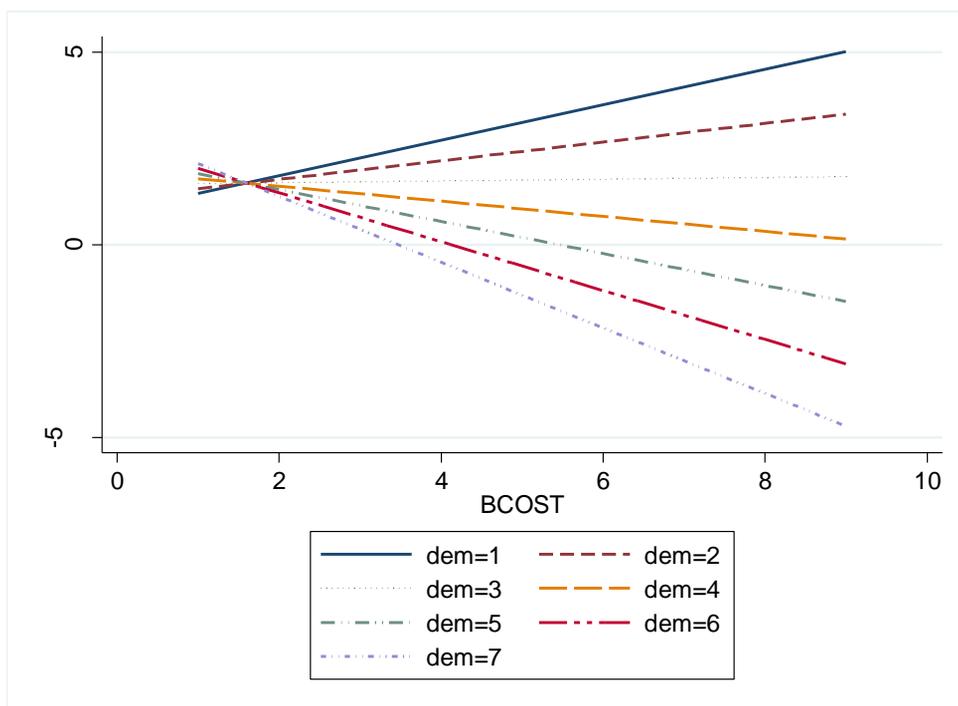|	dy/dx	Std. Err	z	p>|z|	95% Conf. Interval	
BCOST at						
DEM=1	.4609799	.0782872	5.89	0.000	.3075398	.6144199
=2	.2418835	.0679411	3.56	0.000	.1087213	.3750456
=3	.0227871	.0819127	0.28	0.781	-.1377589	.183333
=4	-.1963093	.1114	-1.76	0.078	-.4146493	.0220307
=5	-.4154057	.1473663	-2.82	0.005	-.7042383	-.1265731
=6	-.6345021	.1860921	-3.41	0.001	-.9992359	-.2697684
=7	-.8535985	.2261643	-3.77	0.000	-1.296872	-.4103247

Figure 5 Linear prediction of growth on Bureaucracy Cost for different states of democracy

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Table 16 Effect of Starting a Business Index on growth when democracy is held constant

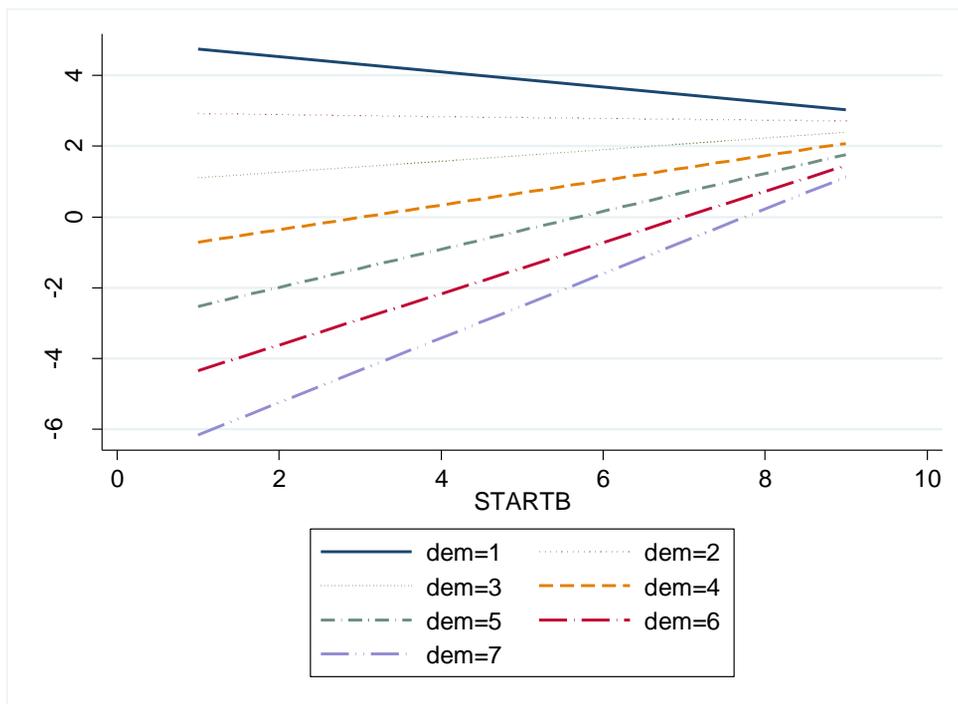|	dy/dx	Std. Err	z	p>|z|	95% Conf. Interval	
STARTB at						
DEM=1	-.214233	.115191	-1.86	0.063	-.440003	.0115376
=2	-.02654	.1044187	-0.25	0.799	-.231197	.1781173
=3	.1611533	.1242093	1.30	0.194	-.082292	.4045989
=4	.3488462	.1638382	2.13	0.033	.0277291	.6699632
=5	.5365391	.2124814	2.53	0.012	.1200831	.952995
=6	.724232	.2652246	2.73	0.006	.2044012	1.244063
=7	.9119249	.3200472	2.85	0.004	.2846439	1.539206

Figure 6 Linear prediction of growth on Starting a Business Index for different states of democracy

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6. Conclusion

This paper presents an empirical application of two proxies, tax rate and entry cost, for political regimes suggested in Acemoglu (2008) on long-term economic growth. Through fixed-effects regression analysis on approximately 100 countries during 1971-2010, I answer some of the questions presented before. Does political regime, or more specifically, the level of democracy, have a significant effect on long-term growth? Can tax rate and entry cost to entrepreneurship work as proxies for democracy? I conclude as yes to both questions. Although the results are sometimes not entirely consistent with each other, considering the fact that the definitions of indices are slightly different from each other and that there is a heavy lack of data available, the results are quite significant. Also, signs become consistent if used as part of a dummy variable. High tax rates and low entry costs to business help boost economic growth.

It is also possible to conclude that political regimes are not clear-cut; that is, it is not desirable to define a country as democracy or oligarchy as a whole. As the loss of significance in the regression with dummy variables shows, I believe political regimes are more of a spectrum. A country can be said to be closer to democracy or oligarchy, but dividing this spectrum in the middle is not an efficient way to distinguish political regimes.

The shortcoming of this paper is that I use annual data analysis, while most economic growth analysis is based on 5-year averages. This was an inevitable choice since data for tax rate and entry barrier were not abundant enough. Use of 5-year average values could lead to each country having only 1 or 2 observations;

therefore, I employed yearly data. I did try to make my model as close to that using usual methods as possible, such as utilizing initial per capita GDP to control for endogeneity. However, I do realize that the result may change if 5-year averages are used instead.

As I state above, this paper has suffered from lack of data, and there also exists a possibility that the indices that I used might not be a correct measure of entry cost to entrepreneurship. Most of the indices reference World Bank's *Doing Business* report, and I would have used this had it not had a short time span (data starts from 2004). It would be interesting to see if the result changes if this World Bank data is used instead of the indices, after more data is accumulated timewise.

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정치 체제의 차이가 경제 성장에 주요한 요소로 작용하는지에 대한 실증 분석

이 유 림

경제학부 경제학 전공

서울대학교 대학원

최근 들어 제도(institution)를 경제 성장에 반영하는 추세가 강해지고 있다. 그러나 지금까지의 연구들은 정치 체제의 차이를 반영할 때 민주주의 지수 등 제 3의 기관이 가공한 자료를 주로 사용해왔다. 본 논문에서는 아세모글루(Acemoglu, 2008)의 이론에서 영향을 받아 장기 경제 성장에 대한 분석을 진행하였다. 즉, 본 모델에서는 정치 체제 혹은 민주주의의 정도를 측정하기 위하여 세율과 기업을 세울 때 처하는 진입장벽을 사용하였다. 민주주의 사회에서는 정치적인 힘이 다수에게 있으므로 재분배를 선호하기 때문에 높은 세율을 원하며, 낮은 진입장벽을 선호한다. 반면 과두제에서는 기업가의 이익을 보호하려 하기 때문에 세율이 낮고 진입장벽이 높은 경향을 보여준다. 본 논문에서는 패널 자료에 대한 고정 효과 모형(fixed-effects model)을 사용하여 민주주의에 가까운 사회일수록 세율이 높고 진입장벽이 낮음을 보여주었다.