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The effect of political regimes and technology on economic growth

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Do political regimes have a significant effect on economic growth? This
study builds on the new neoclassical growth model to identify economic
determinants of growth, and explicitly tests for the influence of political
variables on economic performance for the 1990s. The results suggest that
democracies and bureaucracies significantly outperform autocracies.
Economic growth is also promoted by increased protection of property
rights, and higher investment in education. Moreover, technology has
become a requirement for efficient production, and hence, is crucial in
promoting growth. Countries can therefore increase the level of economic
growth by increasing the levels of education and technology in the
economy, and establishing codified laws to foster property rights.

I. Introduction

In recent years, the literature on economic growth has
gained new impulses from the discussion of political
institutions and systems and their influence on
economic growth. Central question to the debate is
whether democracy functions as a curse, limiting a
country's growth potential, or whether democracy
can promote growth through the opening of markets
and the safeguarding of property rights. Empirical
research on the different effects of democracies
vs. autocracies on economic growth has generated
mixed results. But existing studies have largely
focused on the differences between democracies and
dictatorships. Few studies explicitly differentiate
between dictatorships that codify and announce
laws, i.e. bureaucracies, and dictatorships that rule
in an extemporaneous manner, i.e. autocracies.

Evidence based on case studies suggests that not all
democracies or autocracies abide to the same
principles. The question thus remains which type of
democracy or autocracy can promote growth and
which prove detrimental. The main objective of this
longitudinal study is to empirically investigate the
impact of political and economic variables on growth,
explicitly differentiating between democracies,
bureaucracies and autocracies. We adopt a cross-
sectional time series approach, including 92 countries
over the time period 1990 to 1999, rather than
aggregating over the entire time period. In compar-
ison with previous studies, we also significantly
broaden the number of countries included, focusing
on a selection of developing as well as developed
countries. An additional extension of this study is to
shed light on the role that technology may have
played in increasing growth during the 1990s.

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II. Background

Since Solow's (1956) neoclassical growth model, research by Romer (1986), Lucas (1988) and more recently Easterly and Levine (2001) have spawned the new neoclassical growth theory, integrating human capital as the engine that sustains growth, as well as ascribing increased importance to technology.[1] More recently economists have come to recognize the value and importance of institutions, and research has focused on the specific effects of political regimes on growth. Rodrik *et al.* (2002) and Bhattacharyya (2004), for example, show that institutions trump geography and trade integration in their effect on long-run growth. Similarly, Assane and Grammy (2003) stress the importance of institutional quality for economic development.[2] Following this trend, more and more research has focused on the specific effects of political regimes on growth. As mentioned previously, results outlining whether democracies or autocracies are more successful in fostering growth are ambiguous. Regarding democracies, proponents of the 'win-win perspective' (Kurzman *et al.*, 2002, p. 4) point to the safeguarding of property rights under democratic regimes as the critical feature that helps democracies foster long-term growth. Democracies also allow for the development of markets and competition (Bhagwati, 2002). Stiglitz (2002) highlights participation, transparency and openness as features of democracies that push institutional change and thereby manifest a long-term development and growth path. Looking at the Latin American experience, Feng (1995) finds evidence that faster growth is achieved under civilian rather than military governments. Scholars supporting the 'trade-off perspective' argue that pressures for immediate consumption under democracies render the regime anemic to growth. Moreover, democracies are vulnerable to influences of interest groups, thus not all democracies are equally effective in promoting growth (Rivera-Batiz, 2002). Other results suggesting no relationship between political regimes and growth have prompted some scholars (Przeworski and Limongi, 1993; Brunetti, 1997; Rodrik, 1997) to conclude that political regimes have no significant effect on economic growth.[3] Reasons for this variation may be the lack of

differentiation between autocracies and bureaucracies in most studies, as well as methodological differences.

Most empirical analyses have explored the differing effects of democracies and dictatorships on growth, but few have differentiated between bureaucracies and autocracies as well. Although, studies that attempt to differentiate between the two are limited in size, results do suggest that bureaucracies and autocracies may have significantly different effects on economic growth.[4] A comparison of their definitions helps to shed more light on these differences. In the following, political regimes are broken down into three groups: democracies, bureaucracies and autocracies.

Democracies

Schumpeter (1942) and Dahl's (1971) ideology of 'contestation' is used as the defining feature of democracy. Contestation entails the election of the executive and legislative offices through popular elections. The election of the legislature is especially important in present-day democracies. The regulation of laws limits interest groups in their response to the inequalities that surface. The legislature does so by providing a legal framework that helps sustain property rights through the presence of codified law. Some examples of democracies included in this study are Australia, France, Germany, India, Spain, UK and the USA.

But regular contestation in democracies may also have adverse effects on economic growth. The misappropriation of resources from investment to consumption under democracy that Galenson (1959) points out as its major flaw is a direct result of contestation. The regular legitimization that is a crucial ingredient of democracies leads to efforts by incumbents to increase their chance for reelection while in office. Considering the preference for current consumption over investment amongst the voting populace, incumbents are inclined to implement short-term growth policies that increase consumer spending. At medium levels of income, the increased current spending decreases investment in the long run, and may slow economic growth.

Przeworski and Limongi (1993) also stress that economic growth at medium levels of income requires

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[1] Teles (2005) provides a nice discussion of the applicability of these models to industrialized vs. developing countries.
[2] A good introduction to the field of institutional economics that this area of research builds on is presented in North (1990).
[3] Kurzman *et al.* (2002) summarizes the varying results while compiling 47 studies. The 19 studies showed a positive relationship between democracy and growth, six concluded that democracy and growth were negatively related, while 10 concluded that no relationship existed between democracy and growth. Seven studies found positive but insignificant results, two found negative and insignificant relationships, 2 found both positive and negative results, while one found an inverted *U* effect.
[4] Sloan and Tedin's (1987) study of 20 Latin American countries over the period 1960 to 1979 concluded that bureaucratic dictatorships fared better than democracies, but traditional autocracies fared worse.

large human and machine capital investments, implying a reduction in current spending. This reduction could hurt middle and low-income economies to the point of civil unrest, unless the political regime in power enforces its policies with an iron fist and succeeds in currently saving the amount required for future investment. Dictatorships then, unlike democracies, can conceivably rule with the necessary iron fist and succeed in cutting down current spending to the levels required for consistent economic growth. Yet, there is no definitive reason to assume that dictators are future orientated. Differentiating between bureaucracies and autocracies helps alleviate this issue and let's us further classify the types of regimes that can promote economic growth.

Bureaucracies

Following Przeworski *et al.* (2000), a distinction is made between autocratic regimes that codify laws through the presence of a legislature, i.e. bureaucracies, and ones that govern in an extemporaneous manner, i.e. autocracies. Bureaucracies are dictatorships that have set laws moderating the chief executive in the operation of the government with the help of the legislature. Bureaucracies allow limited participation, and have often begun to open their markets, e.g. China, and thereby incorporate some of the growth-promoting features of democracies. Burkina Faso, China, Laos and Syria are examples of bureaucracies. In comparison, autocratic regimes do not possess universally defined laws. The chief executive holds the power to discriminate at a whim, and seize whatever he deems appropriate at any point in time. This difference in the structure of these two regimes has far-reaching consequences in terms of their effect on economic growth. The presence of codified laws in bureaucracies limits the despotic tendencies of the ruler, increasing the likelihood of a future oriented regime. A despotic ruler would be motivated to maximize personal gain, and not limit his power by sharing the dictatorship with a legislature. The addition of a legislature displays the ruler's desire to set norms of activity through codifying laws, thereby not only limiting his own powers, but also safeguarding the rights of the populous and their property. Regulated laws help enforce contracts, as well as decrease the level of risk associated with the future. As a result, investors feel more comfortable holding property and employing it in the production process. This sense of security increases the level of investment in the economy, hence increasing economic growth in the long run. Also possessing the iron fist necessary to cut

consumption in the short run, bureaucracies are not only more future oriented than autocracies, but are also better equipped to cope with consumption pressures than democracies.

Autocracies

In autocracies, on the contrary, the powers of the ruler can only be limited by the use of force, which is in itself costly. Although a strong state is required to protect property, a strong state in itself is a potential threat. Without the incorporation of codified laws and regulations in a strong state, the regime itself poses a great danger to individuals' rights. The increased risk limits economic initiative, consequently slowing long-term growth. As a result, autocracies lag behind democracies and bureaucracies in fostering growth. For this study, Jordan, Morocco, Nigeria and Saudi Arabia may be classified as autocracies.

III. Methodology and Empirical Analysis

Studies exploring the effect of political regimes on growth employ numerous models. The methodology incorporated in this study aims to overcome shortcomings of previous studies. Following Sloan and Tedin (1987) and Kurzman *et al.* (2002), a longitudinal approach is used to eliminate periodic effects built into common cross-sectional analyses employing average annual growth as the dependent variable. As Przeworski *et al.* (2000) confirm, although averaging smoothens out the effect of the business-cycle, it oftentimes leads to spurious conclusions linking political characteristics to economic performance that occurred at a different time. The time-series approach employed in this study allows regime changes to be incorporated annually into the model. As a result, economic growth under each political regime can be measured more accurately.

Relevance of the nineties

The time period employed in this study is 1990 to 1999, selected for the significant growth spurts that occurred in parts of the world, and the distinct lack of studies exploring this time period. Little is empirically known about the relative growth rates of democracies, bureaucracies and autocracies for the aforementioned period, a period in which the advent of technology has revolutionized the production process. Specifically, the advent of computer technology during the 1990s has spurred the information revolution, augmenting the importance of technology

in every part of the production process. The Internet assists in further increasing the importance of technology by exponentially increasing the dissemination rate of knowledge, hence providing increased opportunities to optimize the production process. The Internet also allows for greater participation of citizens in the democratic process. Hence, using the time period of 1990 to 1999 offers insight into how political regimes have fared in this 'new economy'.

Base empirical specification

$$\text{Growth}_{it} = \beta + \beta_1 \text{Initial level GDP of per capita}_{it}$$
$$+ \beta_2 \text{Human capital}_{it}$$
$$+ \beta_3 \text{Property rights}_{it} + \beta_4 \text{Democracy}_{it}$$
$$+ \beta_5 \text{Bureaucracy}_{it} + (\beta_6 \text{Technology}_{it}) + \varepsilon_{it}$$

The above specification combines the major new neoclassical determinants of growth with three political variables.[5] A pooled cross-section time-series analysis[6] is employed on the above specification, consisting of samples of 92 countries (resulting in $92 \times 10 = 920$ observations) and 58 countries (resulting in $58 \times 10 = 580$ observations), where a proxy for technology is brought into the specification[7] as an additional regressor. Countries that assumed sovereignty during the 1990s were excluded, in favour of a balanced panel. The economic variables used in the models can be found in the *World Bank's World Development Indicators*, while the political variables are derived using Beck *et al.* (2001).

Variables used in the empirical analysis

The dependent variable (Growth) is measured using the annual percentage growth in adjusted per capita Gross Domestic Product (GDP), hence controlling for population changes.[8] The initial level of GDP per capita in 1995 US dollars is used in accordance with

the convergence hypothesis. Solow (1956) predicted, and Barro (1991) amongst others, confirmed that poor and developing countries have opportunities available to incorporate the innovation of developed countries into their production process, and hence maintain higher growth levels than developed countries. Thus higher initial GDP levels negatively affect economic growth.

With respect to human capital, the use of the initial level of education as a measure for human capital lies at the heart of the growth literature illustrated by Barro (1990, 1991), Lucas (1988) and Romer (1986, 1990). In accordance with Barro's work, gross secondary school enrolment levels are used to measure human capital. A higher level of secondary school enrolment thus indicates higher levels of human capital, leading to higher growth levels.

The importance given to technology is another innovation of the new neoclassical growth theory. The recent incorporation of computers into the production process exemplifies the philosophy behind the use of 'computers per 1000 people' as a proxy for technology. A country with more computers has a more efficient production process, and hence should have higher levels of growth.

With regard to the political regime variables, Beck *et al.*'s (2001) database of political institutions is used as a basis of differentiating between political regimes. A regime is treated as a democracy if the executive and the legislature are directly or indirectly elected in popular elections. Constitutional monarchies like Malaysia and Thailand also fit the definition of democracy; although here one party won >75% of the seats in both the executive and legislative offices in these countries, other parties did win some seats. Hence the definition of contestation is fulfilled.

Next, bureaucracies are dictatorships that have certain internal laws for the operation of the government, thus regulating the chief executive with the help of the legislature. Hence, operationally,

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[5] Ramsey's RESET (Regression specification error test) procedure (1969), employed on the above specification(s), indicate that the proposed specification(s) do not suffer from possible omitted variable bias. Please see the bottom of Table 2 for the numerical details of this test procedure.

[6] This technique, by subjecting the observations to two transformations, one designed to remove autocorrelation and the other to remove heteroskedasticity, comes up with a disturbance term (ε_{it}) that is asymptotically nonautoregressive and homoskedastic. To find consistent estimates, OLS is applied to obtain the regression residuals and then these are used to perform transformations so that the error term is asymptotically nonautoregressive and homoskedastic [for details see Kmenta (1997), pp. 618–622]. The particular characteristics of this model are as follows: $E(\varepsilon_{it}^2) = \sigma_i^2$ (heteroskedasticity); $E(\varepsilon_{it} \, \varepsilon_{jt}) = 0$ [($i \neq j$ – cross-sectional independence)], where $\varepsilon_{it} = \rho_i \varepsilon_{i,t-1} + u_{it}$ (as far as autocorrelation is concerned 'ρ_i' is assumed to be different across cross-sectional units and u_{it} is the classical error) $u_{it} \sim N(0, \sigma_{ui}^2)$, $\varepsilon_{it} \sim N(0, [\sigma_{ui}^2 / 1 - \rho^2])$, and $E(\varepsilon_{i,t-1} \, u_{jt}) = 0$ for all i, j.

[7] The effect of technology is captured by usage of computers per 1000 people. However, one may argue that this variable may also pick up the effect of level of development. Other proxies such as R and D spending, number of science graduates etc., could not be employed due to lack of available data. The list of the countries used in the empirical analysis is presented in the Appendix.

[8] GDP per capita is the total gross domestic product divided by midyear population.

bureaucracies are dictatorships that have legislatures. Finally, autocracies are defined as regimes in which there is a chief executive, and possibly a single party, but no legislature. Using autocracy as the base political regime, the dummy variables for democracies and bureaucracies are incorporated to confirm the performance of bureaucracies and democracies in relation to autocracies.

Finally, following Leblang (1996), the effect of property rights on economic growth is gauged through the extent of resources available for private sector activity. 'Domestic credit to private sector as a percentage of GDP' (also available in World Bank's *World Development Indicators*) is used as a proxy for this variable. As Leblang (1996) explains, countries with relatively well-defined property rights have a lower degree of future risk. Consequently creditors are willing to make more loans available and entrepreneurs are willing to borrow more. Hence, a higher level of property rights will result in higher credit levels, and hence higher growth rates.

Table 1 relays the statistical variation in the variables used in Models 1 and 2. The average increase in annual GDP levels is ~2% for both models. With respect to the political regime variables, 78% of all years counted in Model 1 were spent under democracies, 9.57% of years were spent under bureaucracies and 12.17% under autocracies. Although the high mean value of the initial GDP per capita level hints at a healthy global economy, the high SD shows that GDP levels varied dramatically across countries. Similarly, the mean value of >50% for gross secondary school enrollment (i.e. Human capital) also needs to be considered with regard to the high SD of ~30%. Property Rights paint a similar picture with mean values of ~50%, but a SD of >40%. Finally, the low mean value of 86.911 computers per thousand people in Model 2 suggests a continual lack of basic technological progress in most countries in the sample.

Table 2 presents the regression results for both models, which confirm the effect of political regimes on economic growth. According to both models, democracies considerably outpaced autocracies during the 1990s. Hence democracies foster economic growth better than autocracies through the stability brought to the economy. Additionally, the presence of bureaucracies also had a significant positive effect on the level of GDP per capita in countries. This result confirms the importance of separating between the bureaucracies and the autocracies before exploring their relative effects on growth. Moreover, the coefficient of bureaucracy exceeds the coefficient of democracy in both models. A direct *t*-test (presented in Table 3) confirms that bureaucracies were even better than democracies at fostering growth.

The negative coefficient of initial per capita GDP in both models is also in harmony with the expectations of growth convergence, confirming the diminishing returns that developed countries experience.

Table 1. Descriptive statistics*

Name	Model 1 ($n = 920$)		Model 2 ($n = 580$)	
	Mean	SD	Mean	SD
% Change in GDP per capita	1.711	4.1469	2.078	3.789
Initial level of GDP per capita	7529.1	10502	11000	11759
Human capital	57.73	31.333	68.532	28.375
Property rights	49.448	40.547	63.918	42.747
Democracy (dummy)	0.7826	0.4127	0.8379	0.36883
Bureaucracy (dummy)	0.0957	0.29427	0.06896	0.25361
Autocracy (dummy)	0.1217	0.32716	0.09314	0.29083
Technology	–	–	86.911	110.03

Notes: *Variable descriptions (details in the text).
Dependent variable: annual percentage growth in adjusted GDP per capita.
Initial level of GDP per capita: in 1995 US dollars.
Human capital: gross secondary school enrollment levels.
Property rights: domestic credit to private sector as a percentage of GDP.
Technology: number of computers per 1000 people.
Regime dummies
    Autocracy: 1 if there is a chief executive (and possibly a single party) but no legislature, 0 otherwise.
    Democracy: 1 if the executive and the legislature are directly or indirectly elected in popular elections, 0 otherwise.
    Bureaucracy: 1 if there is a legislature under a dictatorship, 0 otherwise.

Table 2. Regression results

Independent variables	Coefficient	Model 1$^{\pm}$ ($n = 920$)			Model 2$^{\pm}$ ($n = 580$)		
		Estimated coefficient	t-ratio 914 df	p-value	Estimated coefficient	t-ratio 573 df	p-value
Constant	β_0	−0.56067	−1.797	0.073	−0.13243	−0.3132	0.754
Initial per capita GDP	β_1	$-8.24E-05$	−5.304	0.000	$-1.16E-04$	−6.9695	0.000
Human capital	β_2	$2.50E-02$	4.65	0.000	$2.87E-02$	4.7094	0.000
Property rights	β_3	$7.77E-03$	2.438	0.015	$5.90E-03$	1.8762	0.061
Democracy (dummy)	β_4	1.277	4.838	0.000	0.7611	1.8921	0.059
Bureaucracy (dummy)	β_5	1.965	4.443	0.000	1.9828	3.1202	0.002
Technology	β_6				$4.05E-03$	3.3966	0.001
F-statistic[df1, df2] (p-value)		13.55 [5, 914] (0.000)			10.281 [6, 573] (0.000)		
Ramsey's RESET χ^2[df] (p-value)		7.158 [3] (0.06702)			4.586 [3] (0.2047)		

Note: $^{\pm}$See footnote 6 for estimation details.

Table 3. Testing the difference in the coefficients of bureaucracy and democracy

	Model 1 ($n = 920$)	Model 2 ($n = 580$)
Hypothesis	H_0: $\beta_5 - \beta_4 = 0$, H_1: $\beta_5 - \beta_4 > 0$	H_0: $\beta_5 - \beta_4 = 0$, H_1: $\beta_5 - \beta_4 > 0$
t-statistic	1.787 [p-value $= 0.0137$]	2.221 [p-value $= 0.0132$]

Additionally, countries that invested more in and hence had higher levels of human capital achieved higher growth rates.

The proxy for property rights confirms the significant effect of private sector credit on economic growth. A higher level of credit to private sector leads to significantly higher growth rates. Leblang's (1996) conclusion in favour of a property rights' effect on economic growth holds weight due to the strength of this proxy. A higher level of credit to the private sector captures the presence of more resources for private sector activity. The presence of an unconstrained financial sector 'indicates the government's commitment to protect private property rights.' (Leblang, 1996, p. 11) Hence property rights do have a significant positive effect on economic growth.

Finally, the proxy for technology in Model 2 is positive and significant, indicating that an increase of 100 computers per thousand people increases economic growth by 0.4%. Considering a mean value of 19.5 computers per thousand people amongst poor and developing countries,[9] the coefficient highlights the growth opportunities that developing countries can tap into by increasing the level of technology in general and the number of computers in particular. The continued robustness of all other variables confirms the importance of including technology.

IV. Conclusion and Policy Implications

The results corroborate the importance of incorporating political regimes into economic growth theory. Countries under different political regimes grew at very different rates during the 1990s. To avoid spurious conclusions, economic growth models must treat autocracies and bureaucracies as separate regimes. Bureaucracies have managed to successfully maintain a longer-term outlook on growth during the 1990s. Growth levels under bureaucracies and democracies are relatively similar and far superior to growth levels under autocracies. Hence, in countries where democracy has failed numerous times for one reason or another, or in countries that have been mired in low growth rates under an autocratic regime, bureaucratic regimes are a definite alternative. The success of bureaucracies during the 1990s may have rekindled the debate on whether democracies really are distinctly better than all other regimes in fostering growth. A debate that has been considered closed for the better part of a decade might just be worth reopening. The new neoclassical determinants of growth also display strong robustness in explaining growth. Specifically, two determinants have strong policy implications: human capital and technology.

[9] Poor and developing countries are defined as countries with per capita GDP $< \$3000$.

Countries that invest heavily in human development achieve more efficient production and as a result, maintain higher growth rates. Hence countries must strive to increase the percentage of people who have access to at least secondary education in order to accumulate human capital, and improve economic well being.

Secondly, technology has become exceedingly important in the success of a nation. With the advent of computers, there is a very real danger of the disparity between developing countries and developed countries increasing faster. Developed countries are not only able to use computers to optimize the production process, but can also quickly access the internet, and employ the added knowledge to further optimize production. On the contrary, not only are developing countries limited by the lack of technology present, but growth is further stunted by the much slower access to information in the absence of computers. Hence, it is doubly crucial for poor countries to strain every nerve and sinew to stay afloat in the technological revolution by investing in it. Further research into the feasibility of utilizing technology in general, and the internet in particular for disseminating education and increasing democratic participation is a must.

Acknowledgements

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Appendix. List of countries (*countries* with missing technology data)

1	Algeria	45	Kenya	89	*Uruguay*
2	Argentina	46	S. Korea	90	Venezuela
3	Australia	47	*Lao PDR*	91	*Zambia*
4	Austria	48	*Lebanon*	92	Zimbabwe
5	*Bahamas*	49	*Madagascar*		
6	*Bahrain*	50	*Malawi*		
7	*Bangladesh*	51	Malaysia		
8	Belgium	52	*Mali*		
9	*Bolivia*	53	Malta		
10	*Botswana*	54	Mexico		
11	Brazil	55	*Mongolia*		
12	*Bulgaria*	56	*Morocco*		
13	*Burkina Faso*	57	*Mozambique*		
14	*Cameroon*	58	Netherlands		
15	Canada	59	*New Zealand*		
16	Chile	60	*Niger*		
17	China	61	*Nigeria*		
18	*Colombia*	62	*Norway*		
19	*Cote d'Ivoire*	63	Oman		
20	Cyprus	64	Pakistan		
21	Denmark	65	*Panama*		
22	*Dominican Republic*	66	*Papua New Guinea*		
23	Ecuador	67	*Paraguay*		
24	*Egypt*	68	*Peru*		
25	*El Salvador*	69	Philippines		
26	*Ethiopia*	70	Portugal		
27	Finland	71	Saudi Arabia		
28	France	72	Senegal		
29	Germany	73	Singapore		
30	Ghana	74	South Africa		
31	*Guatemala*	75	Spain		
32	*Guyana*	76	Sri Lanka		
33	*Haiti*	77	*Sudan*		
34	*Honduras*	78	Sweden		
35	Iceland	79	Switzerland		
36	India	80	*Syria*		
37	Indonesia	81	*Tanzania*		
38	*Iran*	82	Thailand		
39	Ireland	83	*Togo*		
40	Israel	84	*Trinidad and Tobago*		
41	Italy	85	Tunisia		
42	*Jamaica*	86	Turkey		
43	Japan	87	United Kingdom		
44	*Jordan*	88	United States		