An Empirical Study of the Relationship between Democracy and Prosperity

Yujie Zhang
Wright State University - Main Campus

Follow this and additional works at: http://corescholar.libraries.wright.edu/econ_student
Part of the Business Commons, and the Economics Commons

Repository Citation

This Master’s Culminating Experience is brought to you for free and open access by the Economics at CORE Scholar. It has been accepted for inclusion in Economics Student Publications by an authorized administrator of CORE Scholar. For more information, please contact corescholar@www.libraries.wright.edu.
An Empirical Study of the Relationship between Democracy and Prosperity

An Internship Report submitted in partial fulfillment of the requirements for the degree of Master of Science

By

YUJIE ZHANG
B.A., University of International Business and Economics, 1996

1999
Wright State University

Robert Premus, Ph.D
Faculty Supervisor

Hong Wang, Ph.D
Faculty Reader

Roger Sylvester, Director, M.S.
In Social and Applied Economics Program
ABSTRACT


Per capita wealth is far from evenly distributed in all countries of this world. For example, in 1992, real GDP per capita in Japan was about $15,105 (constant dollar using chain index). The corresponding measure for India was $1,282, or about 8.5% that of Japan. While the disparities are large in an absolute sense, they are small in comparison to the richest and poorest countries in the world. Are the rich countries and poor countries developing at the same rate? Have the poor countries shown any signs of catching up? What factors are correlated with the economic prosperity?

This paper focuses on democracy, which is one of the factors that are allegedly correlated with economic prosperity. Attempts are made to use regression analysis to test the democracy relationship and explore its nature. As a conclusion, it is found that democracy has some influence on per capita income, but on the other hand, economic development does not seem to foster democracy.
**Table of Contents**

INTRODUCTION------------------------------------------------------------------------------------------------------------------1

CHAPTER I: WORLD PRODUCTIVITY GROWTH TRENDS-----------------------------------------3
  Productivity Slowdown-----------------------------------------------------------------3
  Convergence-----------------------------------------------------------------------6
  Tabular Analysis-------------------------------------------------------------------7
  Conclusions and Lessons----------------------------------------------------------9

CHAPTER II: RELATIONSHIP BETWEEN DEMOCRACY AND PROSPERITY-------------------13
  Some Existing Work---------------------------------------------------------------14
  Preliminary Models---------------------------------------------------------------18
    Democracy Equations-----------------------------------------------------------19
    GDP equation----------------------------------------------------------------21

CHAPTER III: ONE WAY TEST OF THE RELATIONSHIP-----------------------------------23
  GDP Equation---------------------------------------------------------------------23
  Growth Rates Equation-----------------------------------------------------------29
  Conclusion for the One Way Test------------------------------------------------34

CHAPTER IV: SIMULTANEOUS EQUATION APPROACH--------------------------------------35
  Democracy-GDP Equations System-------------------------------------------------35
  Democracy-Growth Rates Equations system----------------------------------------38
  Conclusions and Limitations-----------------------------------------------------40

APPENDICES
  1. Productivity Trends----------------------------------------------------------43
  2. Convergence Phenomena-------------------------------------------------------45

BIBLIOGRAPHY---------------------------------------------------------------------46
List of Figures

1. REAL GDP PER CAPITA IN U.S.A.--------------------------------------------------------4
2. GROWTH RATE IN U.S.A.-------------------------------------------------------------5
3. REAL GDP PER WORKER IN CHINA------------------------------------------------------6
# List of Tables

1. REAL GDP PER WORKER GROWTH RATES-----------------------------------------------7
2. BARRO’ S REGRESSION OF DEMOCRACY-----------------------------------------------15
3. DEMOCRACY EQUATIONS-------------------------------------------------------------20
4. GDP PER CAPITA EQUATIONS----------------------------------------------------------21
5. REFINED GDP PER CAPITA EQUATIONS-------------------------------------------------23
6. GROWTH RATES EQUATION-------------------------------------------------------------29
7. SIMULTANEOUS EQUATIONS FOR DEMOCRACY AND WEALTH DISTRIBUTION---------------------36
8. SIMULTANEOUS EQUATIONS FOR WEALTH DISTRIBUTION AND DEMOCRACY---------------------37
9. SIMULTANEOUS EQUATIONS FOR GROWTH RATES AND DEMOCRACY-39
Introduction

Per capita wealth is far from evenly distributed in all countries of the world. For example, in 1992, real GDP per capita in Japan was about $15,105 (constant dollar using chain index). The corresponding measure for India was $1,282, or about 8.5% that of Japan. While the disparities are large in an absolute sense, they are small in comparison to the richest and poorest countries in the world. It is often cited that people in the United States spend 7% of their income on food while people in Ethiopia spend 40%. In some parts of the world people work all year to keep from starving. Are the rich countries and poor countries developing at the same rate? Have the poor countries show any signs of catching up? What factors are correlated with the economic prosperity? What should the policy-makers do to foster economic growth? These are some of the questions to be answered in the paper.

This paper consists of four chapters. In the first chapter, I will try to analyze the productivity trends in a selected set of countries of the world. Data are analyzed from around 1950 to 1992, using datasets from the PennWorld, with special emphasis given to the possible evidence of productivity slowdown in many countries after 1973. Tabular analysis will also be used to illustrate some of the findings.

The second chapter is a preliminary attempt to identify relationships between productivity growth and democracy. I will try to test, on the one hand, whether democracy, in the form of political rights and civil liberty, significantly influences
prosperity, and on the other hand, whether prosperity will push the development of political rights and civil liberty. Some existing works are introduced and tested.

The third chapter is devoted to econometric analysis of modified models. Regressions were run to find the determinants of per capita income and growth rates of different countries; interpretations are given.

Since some hypothesize that there is two-way relationship between democracy and prosperity, I will use simultaneous equations models, in the fourth chapter, to address the problem.

The overall conclusions of the quantitative analysis seem to agree with the literature. While democracy does have some influence on per capita income distribution and economic growth rates, the reverse is not true.
Chapter I

World Productivity Growth Trends

It is widely asserted by economists that the world economy experienced a booming period after the World War II; however, this booming economy signified by both significant increase in GDP per capita and GDP per worker come to a sudden halt in the early 1970’s. However, not all economists agree with this slowdown notion. For example, Michael R. Darby (1982) argued that such assertions of slowdown are statistical illusionary. The industrialized countries may have over-estimated the inflation rate and under-estimated the growth rate, and developing countries may have done the opposite. According to Darby, these factors then resulted in the so-called “slowdown illusion.”

Productivity Slowdown

To conduct the investigation of the above mentioned controversy, I first use the PennWorld data set concerning individual countries. Simple statistical and graphical methods are utilized. First, I plot the RGDPC (real GDP per capita in constant dollars using chain index, 1985 international prices) using the basic time series analysis approach. The data sets of a total of four countries (U.S.A, China, Japan and Singapore) and two groups of countries (Asian countries and OECD countries) are used to plot the graphs.
From RGDPC in USA (figure 1.1), I see a clear interruption in the RGDPC growth around 1973. Before 1973, the RGDPC increased at a slightly increasing rate (the slope is about 290). However, in 1973, the curve changed direction and began to come downward (slope is about 210).

In 1974, the RGDPC reached its regional nadir and began to increase again but with a noticeable slower rate with several more similar interruption. So it appears from this graph that there is a slowdown in economic growth in the 1970s in U.S.A. The graph of the increase rate in the RGDPW (real GDP per worker) in USA further confirms the above observation. In figure 1.2, we could see, before 1973, all the points on the increase rate in RGDPW curve except those in two years of 1953 and 1957 are above the zero line. After 1973, more points on the increase rate in RGDPW curve are below the zero line. The curve of the RGDPW in USA also corresponded such change.
A further study of the shapes of the corresponding curves in Japan and in Asian countries and OECD countries as a group also showed similar changes in labor productivity or economic growth (refer to Appendix 1).

However, at this stage, it is still premature to assert that these changes in either economic growth or labor productivity trends are universal. For one thing, the RGDPW in China did not show such a decrease in RGDPW or labor productivity in 1973. Rather, we could see from figure 1.3, it showed a continued increase from 1968 to 1975. This can be duly explained by the status of the Chinese economy – a closed economy with very limited openness. The more isolated economies were somewhat immune to the adverse impact of the slowdown of the world economy.
So I conclude that the slowdown in the growth rate and the labor productivity had plagued a large portion of the world economy, especially in the industrialized nations; however, the slowdown was not universal. Some developing countries, especially those nations with comparatively closed economies did not exhibit the slowdown patterns in their labor productivity and economic growth after 1973.

Convergence

Next I looked at the convergence phenomena in the world economy. Seven countries were picked for this analysis. These countries include the USA, Canada, Germany, France, Australia, Japan, and Korea. The resulting graph (refer to Appendix 2) confirms the assertion that there is obvious convergence among industrialized nations as the curves of CGDP relative to USA=100 (current international price) in those nations approaches that of USA as time increases. The difference between those nations and USA is apparently narrowing quickly. However, at this stage, we still lack evidence to support
support the notion that the gap between the developed countries and the developing countries has significantly narrowed as a whole. One can not deny that the economies of some former developing countries like the Four Small Dragons in Asia (Taiwan, Singapore, HongKong, Korea) have successfully taken off and approached the productivity level and growth level comparable to those of the developed countries; however, there is still large difference in labor productivity and living standard between the developed countries and the developing countries. For countries like China, whose economy has developed rapidly from 1979, following its economic reform, the gap is still apparent, as it is for the many developing countries in Africa.

**Tabular Analysis**

To better articulate the complexity and subtlety of economic development issues, I proceed to use tabular information to address the problem.

**Table 1.1 Real GDP per Worker Growth Rates**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.A</td>
<td>0.023</td>
<td>0.003</td>
<td>0.044</td>
<td>0.014</td>
</tr>
<tr>
<td>Canada</td>
<td>0.03</td>
<td>0.009</td>
<td>0.036</td>
<td>0.031</td>
</tr>
<tr>
<td>Germany</td>
<td>0.046</td>
<td>0.020</td>
<td>0.071</td>
<td>0.075</td>
</tr>
<tr>
<td>Japan</td>
<td>0.079</td>
<td>0.027</td>
<td>0.132</td>
<td>0.072</td>
</tr>
</tbody>
</table>

From this table, we can clearly see the apparent economic growth slowdown in the 1970s in these major industrialized countries. From 1963 to 1973, USA had a three percent growth rate in RGDPW. Other industrialized nations such as German, Canada and Japan also enjoyed the relatively high increase rate in RGDPW. Nevertheless, during the period from 1974 to 1990, all countries experienced a sharp slowdown in the increase
rate of RGDPW. For example, USA had only a 0.3 percent increase rate in RGDPW from 1974 to 1990 compared to a almost eight-fold larger growth rate of 2.3 percent from 1963 to 1973; Japan and Canada also experienced the similar decline in RGDPW. The annual increase in real GDP per worker in Japan declined from 7.9 percent during the 1963 - 1973 period to 2.7 percent during the 1974 - 1990 period.

The annual rate of change in real GDP per worker in Canada also showed a sharp decline from 3 percent during the 1963 - 1973 period to 0.9 percent during the 1974 - 1990 period. German also experienced a more than fifty percent decrease in RGDPW from 4.6 percent before 1973 to 2.0 percent after 1974. However, even though the KAPW (capital stock per worker) in those countries also declined between the two periods except in Germany, the decline was very mild compared with the decline in the major index of productivity level – real GDP per worker. The annual increase rate in capital stock per worker in the United States declined only from 4.4 percent in the period 1963 to 1973 to 1.4 percent in the period 1974 to 1990. The annual change rate of KAPW in Japan declined only from 13.2 percent in the period 1963 -- 1973 to 7.2 percent in the period 1974 – 1990. The annual increase rate in KAPW in Canada almost maintain its level from 3.6 percent in the period 1963 – 1973 to 3.1 percent in the period 1974 – 1990. The annual change rate of KAPW in Germany actually increased from 7.1 percent in the period 1963 – 1973 to 7.6 percent in the period 1974 – 1990. The above analysis supports the conclusions that capital stock per worker is not a strong reason to explain the slowdown in the productivity levels in these four countries.

In 1985, the annual rate of increase in labor productivity was 2.14 percent in Taiwan and was 4.38 percent in Japan. However, in 1994, Taiwan’s productivity growth
was 4.79 percent per year but Japan’s declined to -5.35 percent. In that year, North Korean had an astonishing increase rate of 10.33 percent in labor productivity. These empirical data support the view that developing countries in their catch-up stages tend to have a higher increase rate in labor productivity. As a country evolves into a highly industrialized stage, its rate of increase in labor productivity tends to fall behind that of the developing countries. This pattern helps to explain the convergence phenomenon in the world economy.

Conclusions and Some Lessons

Even though I did a lot of inter-country comparison on productivity change, such method does not guarantee its appropriateness. As a matter of fact, the study of productivity change diverges into two branches with the divergence of one major economic subject—Development Economics into Development Economics and Growth Economics. Unlike the traditional Development Economics in which the economic development experience and lessons of the industrialized countries serve as predominant approaches in this area, the current trend is to fully acknowledge the fundamental difference between the developed countries and the developing countries and to use different approaches to the economic problems in these two different groups of countries. The implication of our study is that even if the productivity slowdown is universal in all countries, the underlying reasons and mechanisms causing the slowdown trends may be different. So besides inter-country studies, more focus should be directed to the comparative study of countries with similar economic background. Consequently, the policy implications to these two broad categories of countries should be different. Some
economic theories and policy implications aiming at fostering continuous growth in the
developed countries may render useless and even hazardous if used indiscriminately in
developing countries.

The study of the productivity change in the world is more related to the normative
economics than related to positive economics with the subject's strong policy
implications. For a long time, people focused on the labor productivity, namely the ratio
of the aggregate number of units of real output produced by nation in a given periods to
the aggregate number of worker-hours employed in producing this real output. However,
the scope of this international development study must be broadened to include more
subjects. Though the GDP per capita and the GDP per worker are the main indexes of the
well beings of the human society, they are surely not all that is important in this field. If
we merely focus our growth or development studies on these "narrowly-defined"
economic factors, our studies will be biased and the policy implication may be hazardous.
For example, in the past two decades or so, the economy of Thailand has developed by
leaps and bounds. Its productivity index represented by GDP per worker averaged
$5566.2 and its economic welfare or living standard index represented by GDP per capita
averaged $2891.5 from 1980 to 1990. However, the capital of Thailand – Bangkok has
the reputation of being one of the most seriously polluted cities in the world. The
environment condition in Mexico City is also alarmingly bad though its economy has
developed rapidly. These scenarios clearly remind us that single-minded pursuit of
narrowly defined economic growth is not sustainable and is not to the best interests of the
human society as a whole.
The perennial interest in productivity and productivity measurement and analysis boils down to two major concerns—economic efficiency and economic welfare. These concerns are closely related, but they are not the same. Efficiency in the use of a country’s resources is obviously a major factor in the economic welfare of its people, but less obviously are the volume and quality of the resources—human and non-human, tangible and intangible—that are available to its workers. The concern with economic welfare, therefore, must embrace the concern with economic efficiency; also, it must go beyond it. For example, in *Economics and The Environment* by Eban S. Goodstein, (1995) sustainable development is defined as providing our descendants with a standard of material and environmental welfare at least as high as that which we enjoy today. One of the measurements of the sustainable development is called Net National Welfare (NNW). NNW is produced using two types of resources: created capital and natural capital. Created capital includes factories and farms, communication, power, transportation infrastructure, educated scientists, administrators and workers. Natural capital include those renewable such as forests, fisheries, productive farmland, clean air and water and those nonrenewable such as petroleum or coal reserves. In our productivity and economic development studies, we include merely a fraction of the indexes pertaining to the economic efficiency and economic welfare. In our future studies, more aspect of the human activities and more indexes pertaining to the economic efficiency and economic welfare must be included.

The argument by Michael R. Darby in *Policies for Long-run Economic Growth* (1982) sheds further lights on the aforesaid arguments. The phenomena we observed in the studies of cross-country comparison of productivity and growth trends may very
likely been complicated or even distorted by the problems associated with measuring real GDP. Especially with the rapid growth in the service sector and high-technology sector, the elusive nature of these sectors in measuring real output has made measuring GDP more difficult. Enormous biases prevail in measuring the real GDP in every country. In certain cases, comparing the real GDP per worker and other relevant indexes with the frame of one country may result in more fruitful and reliable conclusions. Because the same measurement bias may continue to be used in a long time in one country, so that the comparison within this country may cancel out these bias or at least these biases may cause systematic changes in data so that we can analyze these biases and possibly rule them out in our comparison.
Chapter II

Relationship between Democracy and Prosperity

Economists believe that the improvements in democracy of a country may contribute to its economic growth (Barro, 1994). They state this is one of the major reasons why wealth is distributed so unevenly among different countries in the world. It is generally true that developed countries, represented by OECD countries, have a high level of democracy, while developing countries oftentimes are not well functioning in this aspect. Although the neoclassical economic growth model does not explicitly mention democracy progress as a reason for development, we have ample evidence to believe the TPF (total productivity factor) should include this factor (Jones, 1992). Some others (Lipset, 1959) also argue that the economic development could further enhance democracy progress, because we could see in history that, when the economy of a country grows, people in that country enjoy a high level of democracy. Of course, this is not a linear relationship. If what they say is correct, then the two factors could propel each other, the mechanism tends to achieve high level of both, without much exogenous efforts. Is it all so good?

This chapter investigates the relationship between the degree of democracy and economic wealth across countries. In the first part, I will introduce some economists' work on this subject, specifically, Robert J. Barro, who believes that there is very
tight relationship between democracy and economic growth. In the second part, I will try to do use their regression models to test the relationship.

**Some Existing Work**

In 1959, Seymour Lipset tested his hypothesis that "Perhaps the most widespread generalization linking political systems to other aspects of society has been that democracy is related to the state of economic development." He introduced his path-breaking empirical analysis of cross-sectional correlations between the status of political regimes and mid-century measures of economic development for a sample of 48 countries, mainly in Europe and the America. Attempting to overcome the complication problems of mixing political cultures, he divided his sample into two main groups: 28 European and English-speaking countries and 20 Latin American countries. His final results were quite satisfactory, being consistent with his hypotheses. Within the first group, the average per capita income is more than twice as high in the 13 stable democracies as it is in the 15 unstable democracies and dictatorships. Latin American countries all had average incomes less than any of the countries in the first group, with the 7 democracies or unstable dictatorships having average incomes about forty percent higher than the 13 stable dictatorships. Also, when using measures of industrialization, education and urbanization as alternative measures of economic development, he got qualitatively similar results. Thus, his early empirical test brought about a widespread interest in the question of whether the economic development was a prerequisite or a consequence of the level of democracy.
Following Lipset, more economists, especially those specializing in economic growth, began to pay more attention to the impact of democracy on the economic growth.

Robert J. Barro, argued in his *Democracy and Growth* that "there is a suggestion of a nonlinear relationship in which democracy enhances growth at low levels of political freedom but depresses growth when a moderate level of freedom has already been attained." (Barro, 1994, Page 59). He used a dataset of 100 countries to test the hypothesis of "improvements in the standard of living—measured by GDP, life expectancy, and education—substantially raise the probability that political freedoms will grow." The first two columns of Table 2.1 contain regressions of his test.

<table>
<thead>
<tr>
<th>Table 2.1 Barro’s regression of Democracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barro’s Regressions for Democracy Index</td>
</tr>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>Constant</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>democ-1</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>democ-2</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>log(GDP)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>male primary schooling</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>female primary schooling</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>log(life exptcy)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>R-square+A64</td>
</tr>
</tbody>
</table>

The dependent variables are the averages of the democracy indexes over roughly a decade on the basis of Gastil’s separate indices for political rights and civil liberties, each index on a scale from 1 to 7 with 1 representing the highest levels of rights and 7 the
lowest. Summing the two indices gives a measure that takes the value 2 for the most
democratic and 14 for the least democratic systems, which is FR index. At this stage,
PFR index, used in Barro’s model as dependent variable, is made as PFR = (14 - FR)/12,
an index ranging from 0 for no freedoms to 1.0 for fully democratic systems. The
independent variables are indicators of the level of the standard of living, namely, GDP
per capita, life expectancy at birth, and educational level, which is represented by the
years of attainment at the primary level for males and females.

Column 1 of Table 2.1 includes as a regressor one lagged value of democracy
while column 2 two lagged values. I tried to establish a similar model to make some
comparisons by using the later-built Barrolee’s dataset. The democracy index of period
1985-1989 (PFR6) is put on the left-hand side and those of period 1980-1984 (PFR5) and
period 1975-1979 (PFR4) are plugged in the right-hand side as the two different lagged
values. The measures of standard of living, GDP, average schooling in male population
and female population, and life expectancy, all refer to 1985. The final results, shown in
the third and fourth columns of Table 2.1, are very close to those from Barro, with the
signs of all coefficients being the same. However, there is a big question concerning the
reliability of those coefficients. Even in Barro’s model, all the t-statistics in parenthesis
are so small that at the significance level of 5%, the critical value of t is bigger than all
the t-statistics he got. In my comparing computation, the critical value is 1.671 at
significance level of 5%. So, except the coefficient of democ-1 which has a bigger t-
statistics than t critical value, all the other coefficients seem to be insignificant.

Barro has reached a conclusion from his computation that the only negative
coefficients of male schooling attainment indicates that there is a large gap between male
and female attainment, which is viewed as a "signal of greater backwardness." Also, he thinks that "all the other variables have significantly positive coefficients" and that "the target level of democracy is increasing in these indicators of standard of living." Although I am restrained from stating the same conclusion because of such small t-statistics, I am trying to compare my results with his by simply ignoring the t-statistics. The coefficient of the lagged value of democracy, 0.81, approximately doubles that of Barro, but it is still less than one, suggesting that a country's level of democracy tends to move in five years more than half the way toward the value associated with its standard of living. Here, sort of divergence occurs. The Barro's result, 0.46, shows much slower increase rate on the base of the original democracy level. In the second equation with two lagged value of democracy, the estimated coefficients on the lagged democracy variables, 0.71(6.51) and 0.12 (1.12), are each positive, but the first lagged variable has a much bigger one than that of Barro, 0.37 (0.05). Thus, in addition to what Barro says in his analysis - "the pattern of adjustment depends not only on the most recent value of democracy but also on the longer term history," my computation is suggestive of that more weight should be put on the most recent value.

Barro did other work to prove democracy has significant impact on economic growth. For example, in his *Determinants of economic growth: a cross-country empirical study*, he developed an equation (Barro, 1997, Page 13) based on the neoclassical model, in which he included rules of law index, democracy index and education, all these factors have significant t-statistics. Because this research was published only recently, the data should be quite up to date and illustrate current trends.
Preliminary Models

Before establishing any models and running regressions, it is necessary to define the political freedom index used in this test. In the *Comparative Survey of Freedom*, two indices, political rights and civil liberty, are regarded synonymous to the democracy index, although the Survey recognizes that a democratic country does not necessarily belong in the category of "free" states. Sometimes, a democracy can lose freedom and become merely "partly free". In this Survey, "political rights enable people to participate freely in the political process," so in a free society, this means "the right of all adults to vote and compete for public office, and for elected representatives to have a decisive vote on public policies." Civil liberties are "the freedoms to develop views, institutions and personal autonomy apart from the state." According to these definitions, the Survey distributes one checklist of Political Rights with about 8 questions and another one of Civil Liberties with about 13 questions to each country and based on responses to the checklists and the judgments of the Survey team at Freedom House, it assigns initial ratings to countries by awarding from 0 to 4 raw points per checklist item, depending on the comparative rights of liberties present. Under this methodology, the highest possible raw score for political rights is 32 points, based on up to 4 points for each of eight questions, while the highest one for civil liberties is 52 points, based on up to 4 points for each of thirteen questions. Thus, the team then rates political rights and civil liberties separately on a seven-category scale, 1 representing the most free and 7 the least free.
Democracy Equation

Real GDP per capita and education levels are usually considered the major measurements of a country's standard of living. Of the several educational indices and variables included in the Comparative Survey of Freedom, I picked up four to test their relative significance, total enrollment ratio of higher education; the percentage of "Higher School Attained" in total population; percentage of "Higher School Complete" in total population; and average schooling in total population > age 25. Two separate models are estimated for the Political Rights Equation and Civil Liberty Equation. In these equations, rather than using the PFR index, I simply used the Political Rights and Civil Liberty Index, with 1 representing the most freedom and 7 the least freedom. Therefore, when running the regression concerning the relationship between per capita GDP and democracy, a negative sign of the coefficients of the explanatory variables, either per capita GDP or political freedom index, is anticipated.

Table 2.2 shows the results of several regressions explaining variations in political freedoms and in per capita income levels among countries. Column 1 of each of the three equations shows the simplest form of the regression, which shows that only about 32% and 37% of the variance among countries in the political rights index and civil liberty index are explained by variations in per capita incomes. The coefficients of -0.00027 and -0.00026, with t-statistics- -7.87 and -8.78- being bigger than t critical value at significance level of 0.2% (3.23), on the per capita GDP (GDPSH585) in two democracy equations suggest that a 10% increase in per capita income raises the predicted value of the democracy index by about 0.0027 points on a 100-point scale, a very small corresponding increase rate.
Table 2.2 Democracy Equations (t-statistics in parenthesis)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Political Right Equation</th>
<th>Civil Liberty Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Constant</td>
<td>5.0006</td>
<td>5.58</td>
</tr>
<tr>
<td></td>
<td>(+23.63)</td>
<td>(+16.95)</td>
</tr>
<tr>
<td>GDPSH585</td>
<td>-0.00027</td>
<td>-0.00012</td>
</tr>
<tr>
<td></td>
<td>(-7.87)</td>
<td>(-1.82)</td>
</tr>
<tr>
<td>Enrollment ratio of high education</td>
<td>-9.05</td>
<td>-6.17</td>
</tr>
<tr>
<td>% of higher school attained</td>
<td>0.055</td>
<td>0.038</td>
</tr>
<tr>
<td></td>
<td>(+1.09)</td>
<td>0.073</td>
</tr>
<tr>
<td>% of higher school completed</td>
<td>-0.24</td>
<td>-0.26</td>
</tr>
<tr>
<td>average schooling</td>
<td>0.139</td>
<td>0.073</td>
</tr>
<tr>
<td>R-square</td>
<td>0.32</td>
<td>0.5</td>
</tr>
</tbody>
</table>

In the column 1 and 2 of GDP per capita equation, the separate influence of political rights and civil liberty both show greater signs. Plugging two variables of Political Rights and Civil Liberties respectively on the right-hand side results in quite significant negative coefficients: -8.78 and -7.87, both of which are significant at the 96% confidence level. Both coefficients present that when there is one point increase in the respective two democracy index, there will be more than 1000 points increase in the economic wealth. Column 2 of both the political rights and civil liberty equations give us the results when educational indices are added as one indicator of economic wealth. Since the coefficients of two variables, the percentage of "Higher School Attained" in total population and the percentage of "Higher School Complete" in total population, are positive, which are opposite to my assumption and whose t-statistics, 0.88 and 1.09, show the evidence of non-significance at the level of 10%, only one of the educational index can be put on the right-hand side of the democracy equation.
**GDP Equation**

In Table 2.3, Column 4 and 5 of the per capita GDP equation show the variations of per capita income explained by educational, democratic and economic freedom levels. R-squares, 0.77 and 0.767 achieved when separately including political rights and civil liberties index, tell us that approximately 77% of the variations in the national incoming can be explained by these three factors, a relatively bigger explanatory power than that of the national incoming on the political freedom level. The significantly negative coefficients of political rights and civil liberties, -98.6 and -135.8 respectively, suggest that one unit of increase in the political rights and civil liberties level will give rise to

<table>
<thead>
<tr>
<th>Variables</th>
<th>GDP, F</th>
<th>Per Capita</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>9784.37</td>
<td>8802.52</td>
<td>-3586.5</td>
</tr>
<tr>
<td></td>
<td>(+14.09)</td>
<td>(+13.46)</td>
<td>(-2.424)</td>
</tr>
<tr>
<td>HUMAN85</td>
<td>-1389.54</td>
<td>-1689</td>
<td>-135.8</td>
</tr>
<tr>
<td></td>
<td>(-8.78)</td>
<td>(-3.29)</td>
<td>(-0.65)</td>
</tr>
<tr>
<td>CIVLIB6</td>
<td>-1171.7</td>
<td>285.55</td>
<td>-98.6</td>
</tr>
<tr>
<td></td>
<td>(-7.87)</td>
<td>(+0.613)</td>
<td>(-0.554)</td>
</tr>
<tr>
<td>PRIGHTS6</td>
<td>11852</td>
<td>11612</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>(+3.187)</td>
<td>(+3.08)</td>
<td>0.767</td>
</tr>
</tbody>
</table>

about 98.6 units and 135.8 units increase in the economic wealth. The coefficients of average schooling (HUMAN85) and "Free Trade Openness" (FREEOP) in each of the two equations demonstrate their strong correlation with the national incomes. In Column 4 and 5 of the GDP per capita equation, it is clear that with the exception of political right (PRIGHTS6) and civil liberty (CIVLIB6), which have insignificant coefficients even only at 90% confidence level, the other two variables are statistically significant at the 99% confidence level. However, the results need to be further tested, because the R-
square in both cases is relatively small. This indicates that these models are not very good at explaining the wealth distribution.
Chapter III

One Way Test of the Relationship

GDP Equation

To improve the explanatory power of the model, I modified it by putting in some other variables. I tried investment ratios, government consumption ratios, indices of free trade and openness, indices of social stability, and indicators of life quality. The variables that showed insignificant t-statistics were dropped, and I also tested for multicollinearity. The results are presented in table 3.1.

Table 3.1 Refined GDP Per Capita Equation

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Coefficients (T values in parenthesis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log of life expectancy</td>
<td>5407.28 (1.88)</td>
</tr>
<tr>
<td>fertility rate</td>
<td>-330.26 (-1.33)</td>
</tr>
<tr>
<td>Government consumption ratio</td>
<td>-1587.63 (-0.44)</td>
</tr>
<tr>
<td>Investment ratio</td>
<td>58.37 (0.02)</td>
</tr>
<tr>
<td>rule of law index</td>
<td>665.97 (3.48)</td>
</tr>
<tr>
<td>Political rights index</td>
<td>-1186.32 (-1.88)</td>
</tr>
<tr>
<td>Squared political right index</td>
<td>136.31 (1.76)</td>
</tr>
<tr>
<td>civil liberties index</td>
<td>-1855.78 (-2.78)</td>
</tr>
<tr>
<td>Squared civil liberties index</td>
<td>203.24 (2.59)</td>
</tr>
</tbody>
</table>
Table 3.1 shows that, as in previous regressions, replacing the political rights index with a civil liberty index does not cause any major changes in the coefficients of the other variables. They influence the economic prosperity in the same way. So in the following analysis, I will elaborate on the regression model with political rights index, which is the first column of the results.

**Life Expectancy**

As is illustrated in many previous empirical works (such as in *Determinants of Economic Growth*, Barro, 1997), this regression reveals a significantly positive effect on prosperity from initial human capital in the form of health. The coefficient is large enough, 5407.28, to show that a small change in life expectancy would significantly increase the wealth of the country. And the 1.88 t-statistics also shows a valid correlation. The interpretation is that life expectancy proxies not only for health status but more broadly for the quality of human capital.

**Investment Ratio and Government Consumption Ratio**

I did not delete the government consumption ratio, although it has a small t-statistics, -0.44. This result supports the conclusion of the Solow model that this variable, as well as the investment ratio (which has a even smaller t-statistics, 0.02), does not influence economic growth in the long run.

<table>
<thead>
<tr>
<th>Terms of Trade Shock</th>
<th>20021</th>
<th>17032</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(2.03)</td>
<td>(1.76)</td>
</tr>
<tr>
<td>Free Trade Openness</td>
<td>1886.15</td>
<td>1443.46</td>
</tr>
<tr>
<td></td>
<td>(0.57)</td>
<td>(0.45)</td>
</tr>
<tr>
<td>OECD Countries</td>
<td>2808.05</td>
<td>2438.76</td>
</tr>
<tr>
<td></td>
<td>(3.37)</td>
<td>(2.96)</td>
</tr>
<tr>
<td>R-square</td>
<td>0.8761</td>
<td>0.8832</td>
</tr>
</tbody>
</table>
**Fertility Rate**

If the population is growing, a portion of the economy's investment will be used to provide capital for new workers rather than to raise capital per worker. For this reason, a higher rate of population growth has a negative result on $y^*$, the steady-state level of output per effective worker in the Solow model.

Yet a reinforcing effect is that a higher fertility rate means that more resources must be devoted to child care rather than to the production of goods. This argument is supported by the negative coefficient of the fertility rate, -330.26 (-1.33). It indicates that if we could exogenously lower the birthrate of children, the levels of economic prosperity will be enhanced.

**Rule of Law Index**

The rule of law index is an indicator of the overall attractiveness of a country's investment climate. It is a proxy for the effectiveness of law enforcement, the sanctity of contracts, quality of the bureaucracy, political corruption, risk of government expropriation, and the state of other influences on the security of property rights. Although these data are invariably subjective, they have the virtue of being prepared contemporaneously by local experts. Moreover, the willingness of customers to pay substantial fees for this information is perhaps some testament to their validity.

The index that I use was initially measured in seven categories on a 0 - 6 scale, with 6 the most favorable. Here the scale has been revised to 0 - 1, with 0 indicating the worst scenario and 1 the best. This variable had a significantly positive coefficient, 665.97 (3.48), in the model. Thus we can infer that greater maintenance of the rule of law is favorable to growth, as it is expected.
Effects of Political Rights Improvements

If we just insert the political rights variable in the equation, the coefficient is insignificant, indicating an ambiguous correlation between democracy and prosperity. So, rather than testing the linear relationship, I choose a quadratic form of this variable in the model. In this case, the estimated coefficient is $-1186.3 (-1.88)$ for the linear form and $136.31 (1.76)$ for the quadratic form, both statistically significant. And the signs of the results show that wealth is increasing in democracy at low levels of democracy, but the relation turns negative once decent amount of political freedom has been achieved.

The explanation of the positive sign of the quadratic form is simple. It is readily acceptable that more economically successful countries generally enjoy higher level of democracy, as is seen in the countries in West Europe and North America; while for countries in dictatorships, the economic prosperity is not so decent.

However, the negative sign of the linear form means that after a certain point, wealth tends to abound in countries that do not enjoy political freedom and civil liberty, as is in the case of Singapore. The explanation is not so apparent. As we know, in the past few decades, the economically most successful countries are the Asian Miracle nations, many of which has a highly regulated economy and political system. Their people generally have to work very hard, do not have well-protected constitutional rights and freedom. It is interesting to know, is this a required cost of their economical miracle; or, if they had established better democracy, would they still be able to achieve the prosperity?

Fukuyama, in his *Trust: The Social Virtues and the Creation of Prosperity* (1996), offers one interpretation to this phenomenon. His argument is that, mutual trust between
people is an important social capital to economic prosperity, because of its effect in reducing transaction costs and encouraging business practices in a wider range. In the so-called democratic countries, individualism is expanding, and as people are getting more and more atomistic, they tend to distrust other people, especially big corporations and bureaucracies. This disintegration of the social capital adds barriers to business transactions and makes it difficult to achieve the economy of scale. So, the natural conclusion is, after democracy has developed to a certain degree, it will do disservice to economic growth. On the other hand, the Asian countries have a traditional respect for the power of a central government and deep confidence in effective bureaucracies, which makes them efficient in keeping a low transaction costs and developing at a higher speed.

The correlation of the civil liberty index with prosperity was also calculated. The linear form has a negative coefficient, -1855.8(-2.76), and the quadratic form has a positive, but noticeably smaller coefficient, 203.24(2.59), both of which are statistically significant. If we compare the coefficients of civil liberty index with those of the political rights index, we can see that they are larger, indicating a bigger impact on wealth distribution.

**Terms of Trade Shock**

In developing countries, the terms of trade is a very important indicator of their economic competitiveness, because trade is typical way of acquiring wealth by increasing exports, which, for many countries is composed of a handful of primary commodities. The effect of a change in the terms of trade, measured as the ratio of export to import prices, on GDP is, however, not mechanical. If the physical quantities of goods produced domestically do not change, an improvement in the terms of trade will increase real
domestic income and probably consumption through a wealth effect but it will not affect real GDP. Movements in real GDP occur only if the shift in the terms of trade stimulates a change in domestic employment and output.

In table 2.4, we could see that the variable to capture the terms of trade shocks has a significantly positive influence on economic prosperity, 20021 (2.03). Note the big magnitude of this coefficient, which represents by far the most important single influence on wealth distribution. However, one has reasons to doubt the profundity of this leverage. The most successful pattern of economic growth in the past decades has been the export-investment Asian model, which countries put great emphasis on export, yet this is heavily dependent upon a favorable change in the terms of trade. It is due to their success in the 70s and 80s that we saw this particularly large coefficient. But economist are far from agreed that this is an ideal model for development, especially after their turmoil in the 90s. It is dubious that terms of trade could make such a large contribution to prosperity, long term prosperity in particular, ceteris paribus.

**Continental Differences**

I used several dummy variable to catch the differences between countries due to historical, cultural, and other reason. It is generally recognized that African countries are relatively poor, and OECD (Organization of Economic Cooperation and Development) countries, most of which in Western Europe and North America, are rich. And Asian countries, as well as South American countries, are making some progress in the past decades.

The regressions show that the difference between Asian countries, African countries and South American countries are blurred, while the wealth distribution is
clearly in favor of OECD countries. OECD countries, other things held constant, are significantly richer, 2808.1 (3.37), than other countries in the world.

**Growth Rates Equation**

In the above regressions, I have achieved decent R-square values, 87.61% and 88.32%, meaning that the model explains a major portion of the variation of the wealth distribution in this world. However important, the GDP level is a static indicator, reflecting the status quo. More important is the growth rate, which deserves particular attention. Should we be able to explain the variation in the differences in growth rates across countries, the policy implications would be enormous. The following is a regression model with the growth rates as independent variable.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Coefficients (T values in parenthesis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log GDP</td>
<td>-0.022 (-3.89)</td>
</tr>
<tr>
<td>Government consumption ratio</td>
<td>-0.14 (-3.34)</td>
</tr>
<tr>
<td>Average year of schooling &gt; 25</td>
<td>0.0023 (1.523)</td>
</tr>
<tr>
<td>political rights index</td>
<td>0.012 (1.62)</td>
</tr>
<tr>
<td>squared political rights index</td>
<td>-0.0018 (-1.96)</td>
</tr>
<tr>
<td>civil liberties index</td>
<td>0.0078 (0.96)</td>
</tr>
<tr>
<td>squared civil liberties index</td>
<td>-0.0011 (-1.18)</td>
</tr>
<tr>
<td>rule of law index</td>
<td>0.00047 (2.12)</td>
</tr>
<tr>
<td>terms of trade shock</td>
<td>0.09 (1.78)</td>
</tr>
<tr>
<td>Sub-Saharan African countries</td>
<td>-0.037 (-4.18)</td>
</tr>
</tbody>
</table>

29
The R-squares of these two models are 60% and 59%, indicating a decent level of explanatory power of the different growth of different countries in the past few decades. However, they are much lower than the R-squares of the models for the wealth distribution models, which means it is much more difficult to summarize the factors leading to economic growth and to predict the growth pattern in the future. In this section, as in the previous section, I will mainly talk about the political rights equation, which is the first column in Table 3.2. The civil liberty equation yields similar results and has similar implications.

**Initial level of GDP**

The coefficient of the initial level of GDP is negative, -0.022(-3.89) and significant, this means that the wealthier the country is at the starting point, the slower its growth rate. This is a good explanation of why western countries generally grow at 2-3% annually, while developing countries leaping at 8%.

The neoclassical model also predicts this result. The negative coefficient on the log of initial GDP has the interpretation of a conditional rate of convergence. It the other explanatory variables are held constant, then the economy tends to approach its long-run position at the rate indicated by the magnitude of the coefficient. In my model, the result implies a conditional rate of convergence of about 2.2% per year. The rate of convergence is slow in the sense that it would take the economy over thirty years to get halfway toward the steady state level of output.
Government Consumption Ratio

The regression shows a significantly negative effect on growth from the ratio of government consumption (measured exclusive of spending on education and defense) to GDP. The estimated coefficient is $-0.14 (-3.34)$. The particular measure of government spending is intended to approximate the outlays that do not improve productivity. Hence, the conclusion is that a greater volume of nonproductive government spending -- and the associated taxation -- reduces the growth rate for a given starting value of GDP. In this sense, having a big, strong government is bad for growth.

Human capital — Education level

We used to pay a lot of attention to the role of physical capital in economic growth, but now we know that more important is the level of human capital. This model includes human capital in the form of the level of education for an average person of 25 years old or older. The result is significantly positive $0.0023 (1.52)$, meaning that the higher the average years of schooling for adults, the better chance for economic growth.

On impact, an extra year of schooling is estimated to raise the growth rate by 0.23 percentage points per year. Although this result is theoretically in parallel with prevalent ideas, the scale of impact is smaller. According to Barro’s *Determinants of Economic Growth — A Cross Country Empirical Study*, an additional year of schooling would raise the growth rate by over 1 percentage point. The reason may be that I am using a variable representing total years of education, while Barro used years of high school and more advanced education. Since higher level of education are more difficult to achieve, and are backed up by more persons of lower level education, it is natural that increases in the
average year of higher level of education will have a more significant impact on economic growth.

**Political freedom and civil liberty**

Previous regressions have shown that democracy has a significant relationship with wealth distribution, especially in the form of civil liberty. Do they have equally significant relationship with the growth rate, if at all?

The answer is not so clear cut in this case. Again, if we insert the variable in the linear form, the coefficient would be insignificant. But if we apply the same quadratic technique, there seems to be something worth noting. The coefficient for the linear form of political rights index is 0.012 (1.62), barely significant at 90% level (the p-value is 10.9%); the quadratic form has a significantly negative coefficient of -0.0018 (-1.96). These two coefficients indicate that growth is increasing in democracy at low levels of democracy, but the relation turns negative once a moderate amount of political freedom has been attained.

One way to interpret the pattern of the results is that in the worst dictatorships, an increase in political rights tends to increase growth and investment because the benefit from limitations on governmental power is the key matter. But in places that have already achieved a moderate amount of democracy, a further increases in political rights impairs growth and investment because the dominant effect comes from the intensified concern with income redistribution. Thus, growth would likely be reduced by further democratization beyond some critical point, which, as suggested by Barro, is around 0.5, or the levels of democracy in 1994 for Malaysia and Mexico.
In the case of civil liberty index, the coefficients show the same pattern, but are insignificant. Its linear form is 0.0078(0.96), and its quadratic form is -0.0011(-1.16). One implication from this result is that political rights are correlated with economic growth, while civil liberty not. But as a whole, or talking about democracy, these indicate that the relationship between democracy and economic growth rate is far from perfect. It may not be a way good to use democracy to stimulate economic prosperity.

**Continental Differences**

Again, I tested four different dummy variables, Sub-Saharan African countries, OECD countries, Latin American countries, and Asian countries. Only two of them came up with significant results. The coefficient for sub-Saharan African countries is -0.037 (-4.18). This significantly negative result confirms a common view, the growth in this region is extremely unsuccessful. It is, however, surprising to find that Latin America countries, as a group, has the coefficient of -0.04(-6.02). This means that as a whole, the countries in this region are 4 percentage points slower in growth than other countries. Since some Latin America countries, such as Chile, Argentina and Brazil, have made significant progress in the past decades, this result is out of my expectation.

But if we give it another thought, the interpretation is that although some countries in this region had good performance, many other are not, and the number of poor performers may outweigh the number of good performers. Since we are using data based on each country, we are actually taking a simple average of the growth rate of every country in this region, thus as whole, Latin American seems to have been even worse than Sub-Saharan Africa. If we had taken into account the different weight of different nations in this region, the result would not have been like this.
Conclusion for the One Way Test:

Comparing the Political Rights Equation or Civil Liberty Equation with GDP per capita Equation, several discrepancies are readily apparent. The democracy equations show less influence of the democracy variables on the dependent variable than does the GDP per capita equation. Considering the interplay between economic wealth and political freedom only, the democracy level seems to play a very important role in the economic development, but the level of a nation’s economic wealth does not seem to significantly influence the change of democracy. However, because what we have done is only the simplest test, more data analysis is needed to confirm the results.
Chapter IV

Simultaneous Equation Approach

In reality, the democracy and economic prosperity influence each other simultaneously. It is usually assumed that the increase of democratic level will lead to higher economic growth. On the other hand, only when a country achieves a certain level of economic wealth, will it become democratic and people will have political freedom. So, a one-way test cannot fully and correctly explain the relationship between the two variables. A single equation approach thus has a problem of simultaneity: since the intensity of political freedom and economic performance are endogenous, estimates of the effects of democracy on growth without controlling for the effects of growth on democracy will produce biased estimates. I will try to address this issue by using a simultaneous estimation model, with two equations for prosperity and political freedom.

Democracy-GDP Equations System

I will use two equations (the structural equation system), where the dependent variables are political rights index in the period of 1981 to 1985 and the real GDP per capita in 1985. With this two equation system, I use the 3 stage least square method to obtain an estimate of the coefficient. The instruments are exogenous variables such as the historical value of GDP, the historical value of democracy index, etc. Table 4.1 presents the results of the democracy equation. The first column presents the results for the political rights index, the second column the civil liberty index.
Table 4.1 Simultaneous Equations for Democracy and Wealth Distribution

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Coefficients (T values in parenthesis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagged political rights index</td>
<td>0.79 (9.52)</td>
</tr>
<tr>
<td>twice lagged political rights</td>
<td>-0.51 (-4.81)</td>
</tr>
<tr>
<td>Lagged civil liberties index</td>
<td>0.89 (12.42)</td>
</tr>
<tr>
<td>twice lagged civil liberties</td>
<td>-0.17 (-1.6)</td>
</tr>
<tr>
<td>log GDP</td>
<td>-0.19 (-0.78)</td>
</tr>
<tr>
<td>log of life expectancy</td>
<td>0.7 (0.54)</td>
</tr>
<tr>
<td>Political instability index</td>
<td>-1.34 (-2.51)</td>
</tr>
<tr>
<td>Number of coups</td>
<td>0.11 (0.11)</td>
</tr>
<tr>
<td>Latin American countries</td>
<td>-0.52 (-1.93)</td>
</tr>
<tr>
<td>OECD countries</td>
<td>-0.48 (-1.2)</td>
</tr>
<tr>
<td>R-square</td>
<td>0.86</td>
</tr>
</tbody>
</table>

The political equation has R-Square of 86%, and civil liberty equation has R-Square of 0.89. These decent figures show that the equations are good in the sense that they have a high explaining power of the variation of democracy among different countries.

It is not surprising to find that wealth distribution, or level of GDP, does not have a significant relationship with the level of democracy achievements. In the political rights equation, which is the first column, the coefficient of log form of GDP is -0.19 (-
in the civil liberty index, which is the second column, the coefficient is -0.1 (-0.55).

Table 4.2, on the other hand, presents the result of the GDP equation.

Table 4.2 Simultaneous Equations for Wealth Distribution and Democracy

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Coefficients (T values in parenthesis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log of life expectancy</td>
<td>5780.67 (1.99)</td>
</tr>
<tr>
<td>fertility rate</td>
<td>-267.81 (-1.04)</td>
</tr>
<tr>
<td>government consumption ratio</td>
<td>-771.1 (-0.21)</td>
</tr>
<tr>
<td>investment ratio</td>
<td>-302.62 (-0.081)</td>
</tr>
<tr>
<td>rule of law index</td>
<td>708.82 (3.69)</td>
</tr>
<tr>
<td>political rights index</td>
<td>-334.77 (-1.08)</td>
</tr>
<tr>
<td>squared political right index</td>
<td>16.88 (1.56)</td>
</tr>
<tr>
<td>civil liberties index</td>
<td>-463.95 (-1.72)</td>
</tr>
<tr>
<td>squared civil liberties index</td>
<td>30.81 (1.85)</td>
</tr>
<tr>
<td>terms of trade shock</td>
<td>22177 (2.25)</td>
</tr>
<tr>
<td>free trade openness</td>
<td>1801.64 (0.54)</td>
</tr>
<tr>
<td>OECD countries</td>
<td>3137.59 (3.83)</td>
</tr>
<tr>
<td>R-square</td>
<td>0.86 (1.56)</td>
</tr>
</tbody>
</table>

This equation has exactly the same setting as the one that I used to do the one way test. The results are nearly the same except for the coefficients for the political rights index and civil liberty.
The coefficient for the linear form of political rights index is -334.77(-1.08), p-value 28.6%; and the coefficient for the quadratic form is 16.88(1.56), p-value 14.9%. Actually, the pattern of the signs are remained unchanged, negative for the linear form and positive for the quadratic form, only they became both insignificant, with $\alpha$ at 0.1 level.

If we look at the civil liberty equation, we can see that things are better here, the pattern remains unchanged, and still significant. the change is, the coefficients became smaller in scale (from -1855.8 (-2.78) and 203.24(2.59) to -463.95 (-1.72) and 30.81(1.85)), and the t-statistics became smaller, too.

One interpretation for these changes is that, democracy does has some influence on wealth distribution, but the impact are smaller than we had seen in the single equation regression. And since 3-stage least square has the effect of increasing the standard error, the t-statistics shrank, but if we increase the $\alpha$ to 0.3, they are still significant. Another implication, of course, is that civil liberty index seems to be a larger factor in explaining the wealth distribution, not only because it has significant coefficients in both tests, also because its coefficients are clearly larger than those of the political rights index, in both cases.

**Democracy-Growth Rates Equations system**

Next, I tried to explore the relationship between the democracy and growth rate variables using a simultaneous equations technique. I will use a two equation system, with average growth rates of 1980-1985 and democracy (political rights index and civil liberty index) as dependent variable. Again, I will use 3 stage least square method to get
the estimates and use exogenous variables such as GDP level, historical value of democracy index, etc, as instruments.

Table 4.3 Simultaneous Equations for Democracy and Growth Rates

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Coefficients (T values in parenthesis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log of life expectancy</td>
<td>-0.071 (-1.46) 0.037 (0.85)</td>
</tr>
<tr>
<td>Fertility rate</td>
<td>-0.007 (-1.67) -0.005 (-1.46)</td>
</tr>
<tr>
<td>Government consumption ratio</td>
<td>-0.068 (-1.1) -0.11 (-1.78)</td>
</tr>
<tr>
<td>Investment ratio</td>
<td>0.11 (1.73) 0.17 (2.46)</td>
</tr>
<tr>
<td>rule of law index</td>
<td>0.0007 (2.2) 0.0006 (1.76)</td>
</tr>
<tr>
<td>political rights index</td>
<td>0.0037 (0.7)</td>
</tr>
<tr>
<td>squared political right index</td>
<td>0.000019 (0.037)</td>
</tr>
<tr>
<td>civil liberties index</td>
<td></td>
</tr>
<tr>
<td>squared civil liberties index</td>
<td>0.0049 (1.66)</td>
</tr>
<tr>
<td>terms of trade shock</td>
<td>0.29 (1.72) 0.31 (2.05)</td>
</tr>
<tr>
<td>free trade openness</td>
<td>0.047 (0.83) 0.035 (0.62)</td>
</tr>
<tr>
<td>OECD countries</td>
<td>0.0057 (0.41) 0.012 (1.29)</td>
</tr>
<tr>
<td>R-square</td>
<td>0.74 0.6</td>
</tr>
</tbody>
</table>

One political rights equation (civil liberty equation) is exactly the same as the one that I used in the one way test, but the results are reversed in these two equations.
For the political rights index, the linear form has the coefficient of 0.0037(0.7), and the quadratic form has 0.000005(0.037). They no longer display the positive-negative pattern that we saw in the one-way test, and became highly insignificant, or statistically equal to zero. For the civil liberty index, however, the estimates are significant at 0.1 level. The linear form has the coefficient of 0.0049(1.66), and quadratic form has 0.0011(3.004), but they do not have the positive-negative pattern either.

If we look back at the results of the one way test, we can see that the coefficients for political rights index are significant, while those for civil liberty index are not, but in the simultaneous case, civil liberty index are statistically significant, while the political rights index is not. Because of this inconsistency, and also because of the changes in the patterns of the positive-negative signs, I think it is safe to say that the impact of democracy (as a combination of political rights and civil liberty) on economic growth is blurred.

**Conclusion and Limitations**

Political freedom stimulates growth. This is proved by both the single equation and simultaneous equations tests. Although economic growth, to some extent, is helpful to the development of democracy, its effect is not so strong according to my data analysis, especially when compared with the influence of democracy on the economic growth. Therefore, my computations seem to more strongly support a one-way relationship between these two economic and political variables.

It would appear that our mechanism is not ideal; it can not guarantee the simultaneous achievement of economic growth and democracy, both of which we are fond of. The policy implication is that governments need to strive incessantly to increase
the degree of democracy, simply paying attention to economic growth is not enough. If governments fails to do so, the low degree of democracy could impede economic growth.

A good example is the case of Indonesia. Although this country has achieved great prosperity in the past decade, its administration failed to achieve a parallel improvements of democracy; dictatorship and corruption still prevail, people do not have many political rights, there is no rule of law, and press freedom. This is the deep rooted reason for its financial crisis, which began in last year.

There are certain limitations of this study, due to its cross-section nature, the result is only a reflection of the world trends in economic prosperity and growth. If we use the conclusions to forecast the growth of a specific country, the result may not be accurate. Since there are many other factors involved in economic prosperity and growth, it is really hard to extract the correlation between democracy and prosperity in specific countries. Some further studies on the relationship are needed, examples include:

Educational and cultural background largely determine the growth of a nation’s economy. Some nations may not have to strive a lot to improve democracy while trying to develop the economy, because their extensive education and unique culture helps economic growth, one example is Singapore; for nations that lack such kind of culture that could accelerate prosperity, efforts to improve democracy may be a better way for development.

Comparative studies on nations that have similar natural resources and similar productivity yet enjoy distinct democracy status may provide some insights, such as India and China, and Japan and Singapore.
The contribution of this study is that we proved, with empirical evidence, that democratic countries generally are wealthier, and to some extent, have higher economic growth rate. However, economic prosperity does not clearly improve democracy, which means there are some countries that have high productivity and/or economic growth, but still very low level of democracy.
Appendix 1

RGDPC in Japan

RGDPC in Singapore

42
Appendix 2

CONVERGENCE IN CGDP

- USA
- CANADA
- GERMANY
- FRANCE
- AUSTRALIA
- JAPAN
- KOREA, REP
BIOGRAPHY

Policies for Long-Run Economic Growth, 1992 Federal Reserve Bank of Kansas City


Measuring Productivity, 1984, UNIPUB. New York, Japan Productivity Center


