An Empirical Inquiry into the Nature of South Korean Economic Growth

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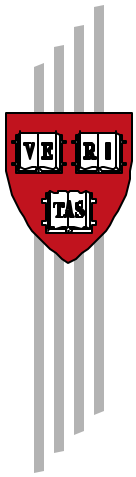

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Abstract

South Korea has experienced spectacular economic growth rates over the last forty years. How did this economic "miracle" occur? Economic growth in Korea can be explained in terms of geography, demography, human development or economic convergence theories. However, the debate over the role of legal, political and institutional development in Korean economic growth is perhaps the most complex of all. This paper offers an empirical estimation of the explanatory variables of growth, touching upon legal, political, cultural and institutional developments, and measures the impact of physical and human capital and productivity increases on economic growth. Using growth regressions, I find that the early protection of property rights and, to a lesser extent, contract enforcement, was extremely important in achieving ex-post growth in South Korea. On top of that, this East Asian country has benefited from a very successful legal tradition from an economic perspective: the German legal system. The uniform composition in terms of race and language has also favored economic growth in Korea while political stability has been crucial over the development period. This last proposition is also tested in a second empirical exercise where I estimate the role of different factors of production, technical change and productivity growth in South Korea. The role of capital accumulation is very important while productivity growth is important and the growth in human capital is moderate. However, productivity is negative only in periods of high political instability, reinforcing the link between growth, productivity, and political developments.

Keywords: Economic growth, Korean economy, political economy, law and economics

JEL Codes: K11, N15, O47, O50, O53

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"In human life, economics precedes politics or culture."

Park Chung Hee, *The Country, The Revolution and I.*

1. INTRODUCTION

South Korea[1] has experienced spectacular economic growth rates over the last forty years. The magnitude of the so-called Korean economic "miracle[2]" is best explained by comparing Korea with some African countries in the mid XX century. The per capita GDP of South Korea in 1960 was inferior to that of Senegal or Mozambique. Forty years later, the GDP per capita of Senegal hardly reaches $1,650 and that of Mozambique stands at $1,000. On the other side, the last available figures[3] indicate that Korea's GDP per capita has gone up to $13,300. Even after the serious currency and financial crisis of 1997-98, Korea remains as one of the economic success stories of the second half of the XX century. How did this economic "miracle" occur? Can other countries replicate Korea's strategy successfully? The debate on the sources of this magnificent growth is by no means over. As I will discuss in this paper, economic growth in Korea can be explained in terms of geography, demography, human development or economic convergence theories. However, the debate over the role of legal, political and institutional development in Korean economic growth is perhaps the most complex of all. Many social scientists that have had a chance to study Korea would agree that politics have played a key role in the economic development of this resource-poor country. Are there ways to test this empirically?

This paper begins by explaining the initial conditions that Korea departed from in the early fifties and sixties and contrasts them with (1) starting point

[1] The official name of South Korea is the Republic of Korea (ROK). South Korea is also referred to in this paper as Korea.

[2] World Bank (1993)

conditions in other countries and (2) current research on the determinants of economic growth.

The second part of the paper gathers the most relevant hypotheses that economists and political scientists have elaborated to explain Korean economic development. Also, in this part I try to link up these theories with the different factors that have contributed to the creation of human capital and the development of legal and economic institutions in Korea over the past forty years.

The third part of this essay is an empirical analysis of political and institutional determinants of economic growth. Although I am aware of the limitations involved, I do a first experiment measuring the year and country fixed effects in a time-series regression analysis for a group of 80 countries over the 1980-96 period. In this experiment I look at the following political and institutional variables: law and order, bureaucratic delay, contract enforcement, quality of the bureaucracy, and corruption. Then, I use regression analysis in a cross-section of countries *à la* Barro (1991) to try to determine which political and institutional factors are especially relevant to economic growth in general and to Korean development in particular. In this experiment, I look at governance indicators for a sample of countries and I test the impact of the quality of regulation, accountability and voice, government effectiveness, political instability and violence, lack of corruption, and rule of law on economic growth. I also take a close look at the legal system and at some cultural variables.

In the fourth section, I use the growth accounting framework of measuring total productivity growth on South Korean economic development, I put the results in context, I try to link up the arguments from the previous sections with these estimations.

[3] Central Intelligence Agency. World Fact Book 2000. http:\\www.cia.gov

2. INITIAL CONDITIONS AND DETERMINANTS OF ECONOMIC GROWTH

The first issue to look at when analyzing the initial conditions of Korean economic growth is probably *geography*. In contrast with economies in Africa or Latin America, there does not seem to be a negative regional bias on economic growth for a country located in Asia. On top of that, Korea is quite far from the equator and, according to Sala-i-Marti (1997), being far from the tropics has a positive effect on growth (See also Sachs, 2000). Sachs and Warner (1995) show that economies with a high ratio of natural resource exports to GDP in 1970[4] grew slowly during the next 20 years and claim that this negative relationship holds true, even after controlling for many variables that other authors have found important for economic growth.

A second key determinant of economic growth is clearly *demography*. Bloom, Canning, and Malaney (1999) have examined links between demographic change and economic growth in Asia during 1965-90. They concluded that the overall rate of population growth had a small effect on economic growth. Instead, they find that changes in life expectancy, age structure, and population density have had a significant impact on growth rates and even claim that demographic effects can explain most of the Asian economic "miracle." Another important issue is that Korea has remained untouched by major epidemics over the past forty years. In economic terms, this means that the economy has enjoyed a steady growth in the supply of labor[5] of about 2.96% per year between 1970 and 2000.

Rodrik (1995) also thinks that *initial conditions* have been key to Korea [and Taiwan] and has elaborated a table estimating primary and secondary enrolment ratios and literacy rates (see table 1). This estimation takes the economic level of Korea and Taiwan as a reference point and it contrasts it with countries of similar

[4] This is the base year in the analysis.
[5] This estimation was done by the author using data from Korea's National Statistical Office.

characteristics. The conclusion that can be extracted from these figures is evident: Korea may have started with a low GDP per capita, but the population's educational level was extraordinarily high. Also, high primary school enrollment levels at an early stage of development indicate in fact that literacy ratios are likely to improve over time as older generations are replaced. Another important point is that inequality was very low in Korea and did not lead to major conflicts in the early stages of development[6]. You (1998) argues that Japan, Taiwan and South Korea are the only countries in East Asia that have legitimate claims to low inequality and that they had a special ability to translate high profit shares into high savings and investment rates. He further claims that low inequality and high profit shares coexisted primarily due to the unusually even distribution of wealth, establishing the possible link between egalitarian wealth distribution and growth[7].

Table 1. Educational Indicators in 1960

	Primary school enrollment ratio		Secondary school enrollment ratio		Literacy rate	
	Predicted	Actual	Predicted	Actual	Predicted	Actual
Korea	57%	94%	10%	17%	31%	71%
Taiwan	67%	96%	12%	28%	36%	54%

Source: Rodrik (1995)

The neoclassical theory of economic growth indicates that there should be some sort of *convergence* among different economies. According to Barro (1999), the convergence property indicates that "the lower the starting level of real per capita GDP, the higher the predicted growth rate." Korea's GDP per capita was lower than Senegal or Mozambique in 1960, so it would seem reasonable to argue

[6] Booth (1999) attributes both the equality and the educational progress to the Japanese colonial legacy.
[7] Fields and Yoo (2000) argue that the labor income equality in South Korea during the development period has been, at least, exceptional. In this empirical analysis they find that the most important factors in explaining the level of labor income inequality are job tenure, gender, years of education, and occupation,

that convergence is also part of the growth puzzle. Furthermore, Koo, Kim and Kim (1998) studied the convergence of regional incomes in Korea and found that it was consistent with the neoclassical growth model, but it occurred much faster (4% to 6% per year) than expected. Thus, convergence at the regional level domestically may have also had a positive effect of the fast convergence between Korea and the developed economies by encouraging regional balanced growth.

Table 2. Growth variables in South Korean Development

Variables strongly correlated with Growth	Effect	Analysis for Korea 1960-2000	Effect on Korean growth
GDP per capita level in 1960	-	Low	+
Primary school enrollment in 1960	+	Very high (94%)	+
Life expectancy in 1960	+	Middle (54 yrs.)	+
Latin America/Africa Dummies	-	Located in Asia	+
Absolute latitude (far from equator line)	+	Far (38 parallel)	+
Real exchange rate distortions(see graph in appendix)	-	Fixed, then pegged	+
Equipment investment (ß=0.2175)	+	High investment	+
Non-equipment investment (ß=0.0562)	+	High	+
Fraction of primary products in total exports	-	Very low	+
Number of years the economy has been open	+	Since 1969* (31)	+
Rule of Law†	+	In place since 1960	+
Political Rights	+	Low till early 90s	-
Civil Liberties	+	Mid. Till early 90s	-
Number of Revolutions	-	1 coup d'état (1961)	+
War Dummy	-	No war after 1953	+
Degree of Capitalism	+	Medium	-

Sources: variables on growth by Sala-i-Marti (1997); variables on Korea taken from World Development Indicators 2000, Rodrik (1995), Clifford (1996), Krueger (1985), and Polity IV database.

Notes: * This date is the one assigned in the Sachs and Warner openness index (The datafile can be downloaded at http://www2.cid.harvard.edu/Warner's%20Files/sachswarneropen.xls)

† Shin and Chang (1998) state that "the existence of a number of substantive economic laws in 1960 is irrefutable."

Bahmani-Oskooee and Rhee (1997) have found that the devaluation of the Korean won has been in general expansionary for the economy. In developing economies, this is not normally the case as devaluations tend to be contractionary (graph 6 in appendix 1 gives an idea of the magnitude of the devaluation). These

while the most important variables in explaining the change in income inequality are years of education, industry, occupation, and potential experience.

exchange rate distortions have thus had a positive impact on South Korean economic growth.

Table 2 includes a set of empirically tested variables that, according to Sala-i-Marti (1997), are correlated to economic growth. I have also included the corresponding values for Korea and whether these variables have affected economic growth positively or negatively in this East Asian peninsula.

Most of the geographic, demographic, and economic data points listed in table 2 can help to explain Korea's impressive economic growth during the 1962-97 period. On the other hand, it is much harder to come to a conclusion on the impact of political variables on economic growth. True, there was no war after 1953 in the peninsula and there was only one coup d'état at the beginning of the development process in 1961 and a substantial degree of political stability except for the 1979-80 period. However, most observers would probably agree as well that there were little political rights and civil liberties in Korea during military rule. Also, the degree of capitalism in Korea was mixed due to the complex business-government relationship and the great involvement of the state in the economy.

Table 3. Variables not contributing to growth in South Korean development

Variables NOT strongly correlated with growth	Analysis for Korea 1962-2000
Government spending	Low
Financial sophistication	Low
Inflation rate	Low
Inflation rate variance	Low
Measures of openness: outward orientation	High
Measures of openness: tariff restrictions	High average tariffs for consumer goods, low for capital goods
Scale effects: total area, total labor force	Small area, labor force over 25m
Ethnolinguistic fractionalization	None

Sources: variables on growth by Sala-i-Marti (1997); variables on Korea taken from World Development Indicators 2000, Rodrik (1995), Clifford (1996), Krueger (1985).

Ghatak (1998) uses vector autoregression (VAR), Bayesian VAR and vector-error correction models to find that growth in South Korea comes from income, investment, export growth, government spending, and exchange rate policies. In this regard, the study by Sala-i-Marti (1997) points out that government spending is not among the variables correlated with growth, although Cheng and Lai (1997) find a bidirectional causality between government expenditure and economic growth in Korea during the 1953-94 period.

Another important issue is to allude to variables that do not seem related to economic growth to avoid making the wrong arguments. Again, according to Sala-i-Marti (1997), government spending, financial sophistication, inflation[8], openness, scale effects and ethnolinguistic fractionalization are not relevant for economic growth. However, other authors would probably disagree with some of these findings. In particular, it could be easily argued that there are endogenous effects of these non-relevant variables on the variables formerly classified as relevant. For example, having a unified ethnic and linguistic group probably contributes to political stability, which in turn has a positive and significant effect on economic growth[9]. However, there are also some pure economic arguments in this regard such as lower transaction costs or smaller information asymmetries. Other social scientists (Hattori and Sato, 1997) have proposed that the differences between Korea and other Asian countries are based on the relationship between government and society and the mechanism of social network formation. The existence of a single ethnolinguistic group has most likely had a significant impact in this regard.

To the departure conditions and growth determinants discussed, I should add two decisive factors in the international political economy of the region. In the first place, United States foreign policy gave clear priority to the economic

[8] Barro (1999) disagrees and estimates that the effect of inflation on growth is significantly negative. This is especially true for countries that have experienced high rates of inflation.

[9] In contrast, Booth (1999) points out that South East Asian governments have been able to focus less on growth related policies and have tended to favor inter-ethnic redistribution of wealth.

development of Korea to counterbalance Soviet power in the north of the peninsula. This meant multilateral foreign aid and technical assistance. The transfer of technology from the United States and Japan to Korea can be considered part of the economic aid package. It is, in some way, the result of the strategic geopolitical position of the peninsula and it had a significant impact on the Korean economic take-off. Secondly, the presence of American troops in South Korea gave significant stability to the country, and it allowed Park to divert military resources into the economy. *Stable deterrence*[10] played a decisive role, since it reduced the possibilities of a military attack of North Korea once the two superpowers, the Soviet Union and USA, had taken stable positions in the peninsula. Somehow, South Korea became a free-rider in the field of defense compared to their northern neighbors[11]. The permanent presence of American troops in South Korean territory not only allowed but rather pressed the state to divert its resources to develop the country. However, it is uncertain whether more emphasis on the military, including a higher spending in defense R&D, would have had a more positive contribution to Korean technological progress than the deviation of those resources to pursue a far-reaching industrial policy. Heo (1999) provides a first approach to this issue in an empirical study where he claims that "the overall economic effects of defense spending on [South Korean] growth are negative although they seem to be indirect or delayed." This finding would support the argument that Korea has benefited economically from some free-riding in the defense and security domain.

[10] This term refers to the mutual threat of self destruction that existed during the Cold War. No party dares to attack first because mutual self destruction is ensured by second strike capabilities. See Mandelbaum, M. (1979), "The Foundation of Stable Deterrence" in *The Nuclear Question: The United States and Nuclear Weapons*, Cambridge University Press, N.Y. pp. 69-98.

[11] For example, South Korean men have to go through 2 years of mandatory military training while North Koreans have to serve for 7 years in the army.

3. HYPOTHESES ON KOREAN ECONOMIC GROWTH

Over the last two decades, economists have tried to provide a coherent, but not always comprehensive, explanation to the great economic success of East Asia in general and of South Korea in particular. However, there is a deep intellectual cleavage[12] with regard to the fundamental reasons behind the economic growth of Korea. The *neoclassical* explanation, initially proposed by Frank, Kim and Westphal (1975) and then by Krueger (1979), focuses on the import-substitution policies started at the end of the fifties and on the export-led development strategy[13]. New growth theory studies (Doganlar and Fisunoglu, 1999 or Glasure and Lee, 1999) add the existence of a bidirectional causality between exports and output growth for the Korean case. The government maintained high protection levels thus allowing little trade on consumer products, while it controlled financial markets completely. Also, loans and subsidies were targeted at strategic industries and companies. The South Korean government stimulated exports through competitive devaluations of the currency and liberalized the import regime little by little. These government measures were supplemented with high interest rates, a macroeconomic policy that definitively contributed to maintain a stable business climate, and public investment in infrastructure and human capital (Krueger, 1979 and 1985). Nam and Kim (2000) also attribute the impressive growth of domestic savings between 1960 and 1995 to the trade reforms and the growth in exports. From a neoclassical perspective, this story has a great internal coherence and responds to the purest economic orthodoxy. Under this view, the state simply seems to contribute to economic growth by designing the right policies and carrying out investments in infrastructure, while the private sector responds to the government's economic incentives in an

[12] This is just a friendly use of Stein Rokkan's term social "cleavage."
[13] Others (see Bhattacharya, 1997) have argued that exports and non-oil world supply shocks each account for no more than a fifth of the variation in output in Korea, supporting the view that exports were not the single driving force behind Korean economic growth.

environment of great political and financial stability. In short, this explanation broadly suggests that both the state and the private sector remained within their *traditional* roles during the development process.

However, other authors in the field of political economy such as Amsden (1989) or Haggard (1990) do not agree with the explanation previously proposed and they insist on the enormous role of the Korean state in the economic development of the country. In fact, this *revisionist* explanation makes a special emphasis in the government's departure from its original functions. These authors suggest that the South Korean government intervened in an extraordinarily active way in the economy and in the technological development of the country. The Heavy and Chemical Industry drive[14] has been a matter of great controversy among economists devoted to the study of South Korean development. Some consider it to be a turning point in Korean modern economic history and a crucial step in the ex-post economic growth (Amsden, 1989), while others are more concerned about the investment distortions that it may have caused (Ueda, 1999) and its adverse impact on growth.

Another hypothesis regarding South Korean economic growth was proposed by Alwyn Young (1992 and 1995). The main argument here comes from Young's estimates of total factor productivity growth (TFPG) in different Asian countries. According to Young, productivity in Korea increased only at 1.7% annually during the period 1966-1990, while the economy grew at a pace of at least 6% per annum. These figures indicate that the main contribution to economic growth was the *accumulation of factors.* That is to say, Korea grew thanks to an increase of production factors including incorporation of new labor force to the economy, a high level of savings, and capital accumulation. A more crude interpretation of these results, according to Krugman[15], is that Koreans worked harder but not smarter. This hypothesis clearly downplays technical change as a source of

[14] See Stern, Kim, Perkins, and Yoo (1995) for a detailed analysis.

growth, since it assumes that economic growth was not the result of a significant increase in productivity but instead the consequence of introducing idle labor force and capital into the economy. However, it is important to notice that although the growth in productivity was not spectacular according to Young's calculation, this annual increase in productivity was not lower than the one the experienced by many industrialized countries[16].

Recent research in *dual TFPG* by Hsieh (1999) throws a new hypothesis[17]. For Hsieh, the macroeconomic statistics offered by the different Asian countries present numerous problems when calculating technical change. Hsieh believes that we have to leave aside the study of quantities and that we have to concentrate on the data of prices because it is more reliable. According to Hsieh, if an important technical change had not occurred and all the growth was due to factor accumulation, return to capital should have fallen dramatically during the last forty years. However, the data demonstrates that this was not the case in some Asian countries. Hsieh indicates that, at least in the case of Singapore, estimates of dual TFPG suggest that productivity has played a decisive paper in the economic development of this Asian dragon. He also insists in the possible applicability of this analysis to other Asian countries. However, Hsieh is not able to find a similar pattern in Korea, so the validity of this hypothesis in this discussion is quite limited.

Dani Rodrik (1995) has pointed out that export incentives played a very important role in the economic development of Korea. Yet, the fact that these measures were adopted half a decade before the export boom took place indicates that these incentives could not be the fundamental reason for the economic take-off. The existence of this time lag has led Rodrik to elaborate an

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[15] See, for example, Krugman, Paul "The myth of Asia's miracle ", Foreign Affairs, Nov. 1994 or Krugman, Paul, "What ever happened to the Asian miracle?", Fortune, Aug. 18, 1997.

[16] The comparable figure for the same period (1966-90) in the US was 0.6% and in Japan 2.57%. This calculations have been made by the author based on data provided by Prof. Ryuzo Sato.

alternative explanation centered in what he denominates a *coordination failure*. For Rodrik, the key factor that separates South Korea from Mozambique or Senegal in 1960 is the initial conditions of their social infrastructure. That is to say, a relatively high literacy rate and a high educational level compared to these two African countries. Also, the distribution of wealth in the Korean society did not show the same inequality patterns that could be found in Latin America. This factor, Rodrik argues, isolated the government from social demands and it allowed the adoption of aggressive investment policies without having to address issues of historical justice. This last explanation clearly downplays the fact that South Korea was a dictatorship. In my opinion, this factor is much more important when explaining why a government is more or less insulated from social pressures.

The argument presented by Rodrik is based on the impossibility of an economic take off under a decentralized economic regime because demand does not exist. However, through coordinated subsidies to key industries, the government could overcome this difficulty by creating supply and demand in a coordinated way, thus expanding the production possibilities frontier of the country. Thanks to an exogenous increase in the return to capital, imports of capital goods expanded. The increase in the level of imports necessarily propelled an increase in the volume of exports necessary to generate foreign currency that would finance the acquisition of capital goods. Rodrik (1995b) also suggests that exports in East Asia have been driven by an increase in the profitability of investment instead of the other way around. He argues that since saving rose alongside the desired investment, the investment boom was necessarily accompanied by an investment boom both in imports and export. This is consistent with the argument presented by Hong (1997) in an empirical study. This author suggests that the success of the manufacturing sector in South Korea

[17] Some authors (see, for example, Sing and Trieu, 1999) have reviewed Young's estimates and argue that the Korean growth experience can not be only explained in terms of factor accumulation, but their results

owes a lot to foreign capital, since FDI[18] alone accounts for almost 20% of the growth in this sector. The increase in profitability may have caused this surge in inflows of foreign capital.

Table 4. The five major hypotheses on Korean economic growth

Explanation	*Author*	*Engine of growth*
Factor accumulation hypothesis	Young	Accumulation of labor and capital
Neoclassical hypothesis	Frank, Kim and Westphal Krueger, World Bank	Export promotion and import substitution
Coordination failure hypothesis	Rodrik	Coordination between private and public sectors by government
Revisionist hypothesis	Amsden Haggard	Governmental intervention, *dirigisme*
Dual TFPG hypothesis	Hsieh	Increase in productivity

Source: Adapted from Garcia-Blanch (2000).

HUMAN CAPITAL DEVELOPMENT

All hypotheses explaining Korean economic growth coincide in stressing the importance of the human factor. Clearly, the quality of human capital in Korea at the beginning of the development process is very high for its level of economic development, as the estimates of Rodrik show (table 1). Another fact that is usually ignored is the low literacy rate after the Korean War. According to Kim[19], over 78% of the population did not know how to read or write in 1953, a number that could be more in line with Rodrik's estimates. However, Kim's (1997) figure is hard to believe if we consider that by the end of the Rhee administration a few years later illiteracy rate stood at 27.9%. This would mean that half of the Korean people learned to read and write merely in seven years, a remarkable, unique, and highly unlikely social achievement. In any case, it seems reasonable to assert that, although Rhee's administration is usually perceived negatively in terms of economic development, this period played an

have not been broadly acknowledged.

[18] Foreign Direct Investment

[19] Kim Linsu. (1997)

important role in later development because it helped to consolidate an important base of human capital. The government of Park continued a very aggressive educational policy and was able to practically eliminate illiteracy in Korea by the mid-seventies.

Park found a way to take advantage of this high educational base to develop tertiary education. A strong impulse in scientific and technological policy would have been of little help without the adequate human resources. This way, large numbers of Korean students were sent abroad and then came back to companies, universities and research centers to start different scientific projects[20]. The state invested heavily as well in the domestic development of tertiary education. Korea went from having 38,400 university students[21] in 1953 to 1,150,000 in 1994. The importance of state intervention in tertiary education is also reflected by the fact that the best university in Korea, Seoul National University, is public[22]. What makes the Korean educational policy especially interesting is the enormous number of engineers and scientists that it has been able to produce in a short period of time, which would have been unlikely if illiteracy rate was so high in 1953. In the last stage of Park's government, Korea had already four times more engineers and scientists per million people than Brazil or Singapore and seven times more than India (see table 5). Green, Ashton, James, and Sung (1999) point out that the expansion in vocational education that followed the Heavy Chemical and Industrialization Plan (HCIP) was directly supervised and coordinated by the Blue House itself[23]. According to these researchers, it was "a kind of package with the aim of producing graduates to go straight into the factories." Today, the Korean government still supervises the curriculum, rules, examinations, staffing,

[20] In proportion to the size of the population, only Taiwan has sent more students over to the United States than Korea.

[21] Office of Statistics, *Tonggyero bon Hankukeo Baljachiu* (Korea's progress in Statistics) (Seoul: Office of Statistics, 1995)

[22] Lim (1999) argues that Korean universities in general have played a key role in human capital formation and that this has significantly enhanced industrial productivity. Green et al. (1999) discuss the importance of the role of the state in this process and conclude that it was instrumental.

and resource allocation in both the educational and training systems, clearly reinforcing the view of the key role that it still plays in human capital formation.

Table 5. Human Capital Indicators

		Korea	Brazil	Singapore	India
Scientists and Engineers per million	*1960s*	6900	5600	NA	1900
	1970s	22000	5900	5200	3000
Scientists and Engineers in R&D per million	*1976*	325	NA	263	46
	1978	398	208	317	NA
	1984	921	362	908	134
	1995	2235	168	2318	NA

Source: Amsden (1989) and World Development Indicators (2000) for data on 1984 and 1995.

Another important point with regard to education has been the egalitarian nature of training and skill development opportunities promoted by the government since the mid sixties (Green *et al.*, 1999). The competitive system set in place since Park's administration has contributed both to a relatively equal income distribution and to a broader acceptance of the social structure in South Korea. The link between these byproducts of the educational policy and political stability are likely to be strong, thus having an additional positive effect on growth. On the other side, this does not mean that there has been no social unrest in Korea. Social unrest has in fact been strong but it has had more to do with labor unrest regarding the limitation of workers' rights and student demonstrations for political change.

In the light of this evidence, it is difficult to agree with Krugman (1994) when he states that Asian countries have not learned to work smarter. It may be true that Korea has grown mainly through the accumulation of factors, but it may be reasonable to state that that human capital has become substantially more

[23] The Blue House is the equivalent of the White House in the US, or the highest office in the executive

productive. Furthermore, a growth in the number of engineers and scientists of such a magnitude necessarily has to have very positive effects on both product and process technologies.

Table 6. Scientific and technical journal articles (per capita)

	1981	1985	1989	1992	1995
Korea, Rep.	0.0000043	0.0000104	0.0000215	0.0000330	0.0000659
Brazil	0.0000116	0.0000108	0.0000121	0.0000166	0.0000173
Singapore	0.0000534	0.0001164	0.0001545	0.0002047	0.0002983
India	0.0000167	0.0000125	0.0000101	0.0000096	0.0000084

Note: Only data for years shown was available.
Source: Estimated by the author using the World Development Indicators CD-ROM, 2000.

The number of scientific journal articles per capita in South Korea grew 1518% (100% is the base year) from 1981 through 1995, or a 20% increase on average per year over a decade and a half. The numbers for Singapore are 559% and 12% respectively, while Brazil stands at 150% and 3%. India, on the other hand, experienced a negative growth of –4.5% per year in the number of scientific and technical publications over the same period. Clearly, South Korea has had an impressive human capital development. However, as I point out in section five, while the stock of human capital grew 45% between 1970 and 2000, physical capital grew by 3449%. This means that physical capital grew[24] during this period at a compound rate of 12.7% while human capital grew only at 1.26% per year on average during the same years.

LEGAL DEVELOPMENT

So far, I have stressed the importance of the Rhee government in developing the literacy base that allowed the latter creation of a solid educational system under Park. Another key achievement of Rhee's government was the redefinition of a legal base. The Civil Code, enacted in 1958 and effective as of January 1, 1960

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branch.

gathers most of the basic laws governing property rights[25]. The Codes of Civil (1953) and Criminal (1954) Procedure and the Copyright Act (1957) are a legacy as well of the Rhee regime. Concerning the legal system up to the early 1960s, Shin and Chang (1998) conclude that "although a set of fundamental laws was in place at that time, the lack of enforcement institutions and coherent government policies [...] makes it difficult to classify the nature of the laws" and "regulation of the financial and commercial sectors was quite strict and the government often seemed to act quite arbitrarily in implementing changes" although they also acknowledged the particularly positive attitude of the law towards property rights, a key variable of economic growth.

Finally, the early Labor Union Act, the Labor Standards Act and the Labor Dispute Adjustment Act were inspired in the American legal model of labor protection in 1953. However, enforcement of worker's rights was not effective in practice, which translated into long working hours and poor working conditions. Park's administration continued this policy, as the government restricted both collective bargaining and collective action under the Special Act of National Security of 1971, effectively locking up a disciplined, hard-working, enduring, cheap labor force. In 1987, the new democratizing wave pushed for reforms and established minimum wage standards, re-allowed collective action and bargaining, and significantly enhanced workers' rights. However, the situation for the Korean working woman did not improve that dramatically. Seguino (1997) presents econometric evidence supporting the hypothesis that women's weaker position limited their ability to bargain wage raises that made up for increased productivity growth in the manufacturing sector.

The Korean Commercial Code enacted in 1962 enabled the creation of limited partnerships, general partnerships, stock companies and limited companies. In

[24] The stock of physical capital takes into account the depreciation. In this case, I assumed 5% yearly depreciation.

[25] Prior to that, the Japanese Civil and Commercial Codes, texts based on the germanic legal tradition, were in place.

the early 1960, conciliation and mediation were not available as dispute solving mechanisms and the Arbitration Act was passed in 1966. This implies that informal institutions for dispute resolution did not exist until the late sixties. Another important issue is that the principle of separation of powers (*trias politica*) engrained in the Constitution was not applied in practice and law was seen as an agent of political regimentation (Shin and Chang, 1998). Still, the same authors point out that "as far as ordinary civil cases were concerned, judges still appeared to maintain a certain level of independence."

The influence of Confucian values[26] is also inherently ascribed to the Korean legal system, making customary law very relevant in some specific contexts where the law was not precisely defined. An example from Hahm[27] is particularly illustrative of the social justice flavor of the Korean legal tradition: "If a destitute family illegally built a shack on another's land, 80.25% [of the people interviewed] would let them stay, and only 7.15% would force them to leave. If the land was needed, and the family refused to move, only 14.76% would have resorted to the law, while 40.68% would have given the family money to move."

Another important pillar of economic growth is competition and, in this regard, the first attempt to establish some sort of competition law[28] in Korea did not come until 1975, although the main worry behind the enactment of this law was stabilizing prices. The first text addressing the problem of monopolistic competition[29] actually had to wait until 1980. Notice that the economic development period in South Korea is normally considered to start in 1960-61, meaning that the word "perfect competition" has not been in the jargon of Korean lawmakers for at least half of the development process. In fact, the

[26] In this context we may interpret Confucian values as favoring harmony over argumentation or dispute.
[27] Hahm Pyong-Choon in Choi Chong-Ko (1989), "Traditional Korean Law and its Modernization," *Transactions of Royal Asiatic Society*.
[28] The actual name of this piece of legislation is the "Price Stabilization and Fair Trade Act" and jointly addressed the issues of price stabilization and the promotion of free competition in the market place.
[29] Monopoly Regulation and Fair Trade Act (1980)

Monopoly regulation and Fair Trade Act (1980) is the first legal document that aims at "[...] promoting the balanced development of the Korean economy."[30] After the stock market crash of 1962, the government also tried to redefine the framework for the development of capital markets. However, until the mid seventies, most companies ignored the benefits of going public, and this led to the introduction of significant measures to reduce the reliance of the corporate sector on private loans as a source of financing. The consequences of these failed financial policies of the early sixties are well-known, but little was done to improve the situation over the next thirty years. Little equity capital, excessive leverage, too many bad loans and, of course, a financial and currency crisis in 1997.

In sum, Korea had a significant legal base at the beginning of the development period and, most importantly, has had laws enforcing the protection of property rights for the past forty years. On a more negative note from a social perspective, legislation protecting workers' rights was not enforced, although it is hard to say that this may have had a negative impact on economic growth. On the contrary, less workers' protection may probably the prospects of economic growth, particularly for a developing country. A final, but more controversial issue is competition law. While perfect competition is a usual assumption in economic models, it seems quite obvious that Korea has managed development very successfully without anti-monopolistic regulations. Studying the legal developments in South Korea actually makes quite a compelling case against the neoclassical view, and reinforces significantly the revisionist arguments.

INSTITUTIONAL DEVELOPMENT

The role of institutions is key to understanding South Korean economic development. A key part of any institutional analysis is the role of the bureaucracy. In that regard, Cheng, Haggard, and Kang (1998) argue that

[30] Shin and Chang (1998)

political leaders in South Korea had an interest in reforming the civil service to carry out programmatic initiatives started by Park Chung Hee. According to their study, the Korean government tried to introduce meritocratic elements in the design of the new public administration, while keeping insulated agencies to coordinate overall economic and other policies. On the other side, Lim (1998) emphasizes the role of coalition in the selection of industrial policies and the changing coalitional structure between power groups in the restructuring process. Some institutions have been particularly strong in the case of Korea and others especially weak, but the links between these and economic growth are hard to establish. Rodrik (2000) argues that there are five types of important institutions for growth: property rights, regulatory institutions, institutions for macroeconomic stabilization, institutions of social insurance, and institutions of conflict management. Out of these five, Korea has enjoyed good property rights and conflict management institutions, as well as fairly good institutions for macroeconomic stabilization. Social insurance was provided by companies and sometimes the government but the most important social insurer is probably extended family network. Finally, in the light of the legal evidence it is hard to argue that Korea had good regulatory institutions that ensured a competitive environment in different sectors.

In fact, some authors (see Lee C. H., 1999) argue that the demise of institutions after the mid 1970s brought "an institutional hiatus with serious consequences to the economy," and that Korea is in urgent need of reforming its old informal institutions. This may be particularly true with regard to the regulatory framework, although there is little evidence of high quality regulatory institutions until the mid nineties. A reinterpretation of Lee CH (1999) may be that regulation set in place in the sixties and seventies worked well in a controlled, protected economy but did not work as well in the more competitive and deregulated environment of the nineties. Table 7 gathers most of the key

legal, financial, industrial, and technological institutional developments over the past fifty years in South Korea.

Table 7. Institution building in South Korea

Decade	Legal developments.	Industrial/legal developments	Financial institutional dev.	S&T Institutional develop.
1950-60s	Constitution (1948) Labor Union & Labor Standards Acts (1953) Criminal Code (1953) Codes of Civil (1953) and Criminal (1954) Procedure. Copyright Act (1957) Civil Code (1958) Commercial Code (1962) Bankruptcy Law (1962) Pollution Prevention (1963) Arbitration Act (1966)	Mechanical Engineering Industry Promotion Act (1967) Ship-building Industry Promotion Act (1967) Electronic Engineering Promotion Act (1968)	Bank of Korea Act (1950) Privatization of Commercial Banks (1957) Foreign Capital Inducement Act (1960) Securities and Exchange Law (1962) Act Relating to Capital Market Support (1998) Korea Investment Corporation (KIC) (1968)	MOST S&T information center
1970s	Competition Law (1975)	Oil & Chemical Industry Promotion Act(1970) Non-steel Metal Industry Promotion Act (1970)	Going Public Encouragement Act (1973) Securities and Exchange Commission (1977) Securities Transaction Tax (1979)	Public research institutes
1980s	Monopoly regulation and Fair Trade Act (1980) New Copyright Act (1986) Declaration of Democratic Reforms (1987)	Engineering Industry Development Act (1986)		S&T commissions R&D cooperatives
1990s			Foreign Investment Stimulation Measures (1994) Financial Supervisory Commission (1998)	Cooperative R&D system

Source: STEPI (1995), Shin and Chang (1998).

4. EMPIRICAL ANALYSIS OF THE DETERMINANTS OF SOUTH KOREAN ECONOMIC GROWTH

In this part of the paper, I want to test some of the empirical propositions reviewed in earlier sections as well as some of the implications of the legal, political, cultural and institutional developments on economic growth and apply them to the Korean case. For this purpose, I have used both time series and cross section regression analysis.

4.1 THE MODELS

The fixed-effects time-series growth linear regressions were estimated using the following specification:

[1] $y(i,t) = a + ? * x(i,t) + u(i) + e(i,t)$

where y is the dependent variable (GDP per capita growth over the study period), i stands for the country, a is a constant, ? is the coefficient of the independent variable x at time t, and u and e are the error terms.

On the other hand, cross-section growth regressions were estimated using a simple ordinary least squares model based on the following specification:

[2] $y(i) = a + ? * x(i) + e(i)$

where y is average growth of GDP per capita over the 1960-95 period in country i, ? is the coefficient of the independent variable x and e is the error term. The control variables used in the experiments are per capita GDP in 1960 (GDPSH460), to account for convergence, and average years of education (SCHOOL60) in 1960 to account for the human capital effect.

4.2 THE DATA

In the time series experiment, I used data from the Business Environment Risk Intelligence (BERI) and International Country Risk Guide (IRCG) data sets. These data are available for 80 countries over a 16-year period (1980-1995), although many countries do not have data for the first five years (1980-84) thus slightly limiting the possibilities of the experiment. The variables are the following: Law and order (IRCG), Bureaucratic delay (BERI), Contract enforcement (BERI), Quality of the bureaucracy (IRCG), and Corruption (IRCG). Higher values correspond to better law and order systems, less bureaucratic delay, better contract enforcement, better quality of the bureaucracy and less corruption. The dependent variable (per capita GDP growth) comes from the 2000 World Development Indicators CD-ROM data set, and the control variables, GDP per capita in 1960 and average years of education in 1960 come directly from the Barro-Lee data set (see appendix for more details).

In the cross-country growth regressions, I have also made use of some data from the Barro-Lee data set in particular for the average years of education and the average GDP per capita growth. The political variables come from two different data Sets. The first inputs come from the Levine-Loayza-Beck Data Set[31]. In particular, I have used: the business regulation index, the index of bureaucratic efficiency, the index of state-owned enterprises, revolutions and coups, assassinations, an index of civil liberties, ethnic fractionalization, the property rights index, the risk of expropriation, the level of legal enforcement, the general rule of law, the different legal origins, and a couple of geographical variables indicating distance from the equator and location (see appendix 2 for definitions).

The second set in the governance and institutional analysis comes from the *Worldwide Governance Research Indicators Dataset* (World Bank). Originally, this

[31] This dataset is available for downloading at the Economic Growth Research Group Webpage of the World Bank (see appendix for details on how to obtain the data).

database offered a cross-section of 173 countries. The data used to create these indicators is mostly for 1997-98 and I have adjusted it into continuous variable indexes ranging from 0 to 5. These indicators measure the following: quality of regulation, accountability and voice, government effectiveness, political instability and violence, lack of corruption, and rule of law. More details on the number of countries used in each experiment are included in the regression tables and also in appendix 2.

4.3 RESULTS

The results of the fixed-effects time-series growth regressions[32] are quite interesting. Table 8 gathers the initial results without any control variables.

Table 8. Fixed-effects by year time-series growth regression without control variables

```
Fixed-effects (within) regression               Number of obs      =       398
Group variable (i) : year                       Number of groups   =        11

R-sq:  within  = 0.0421                         Obs per group: min =        35
       between = 0.1705                                        avg =      36.2
       overall = 0.0329                                        max =        37

                                                F(5,382)           =      3.36
corr(u_i, Xb)  = -0.1623                        Prob > F           =    0.0055

------------------------------------------------------------------------------
    gdppcgrw |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    laworder |  -.4857532   .2172537    -2.24   0.026    -.9129159   -.0585904
       delay |   .8533562   .9140106     0.93   0.351    -.9437655    2.650478
     enforce |   .8340182   .8192364     1.02   0.309    -.7767591    2.444795
     corrupt |   -.650918   .2962139    -2.20   0.029    -1.233332   -.0685043
    bureaucq |   .4703987   .2873953     1.64   0.103    -.0946761    1.035473
       _cons |   .8406037   .8677997     0.97   0.333    -.8656584    2.546866
-------------+----------------------------------------------------------------
     sigma_u |  .82886495
     sigma_e |  4.4679188
         rho |   .0332707   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(10, 382) =     1.16             Prob > F = 0.3163
```

[32] The exact instructions in Stata that resulted in this outcomes are the following:
xtreg gdppcgrw laworder delay enforce corrupt bureaucq, fe i (year)
xtreg gdppcgrw gdppc60 yreduc60 laworder delay enforce corrupt bureaucq, fe i (codenr)
xtreg gdppcgrw gdppc60 yreduc60 laworder delay enforce corrupt bureaucq, fe i (year)

Although the former experiment lacks control variables and thus some empirical validity, this regression is particularly interesting because it reveals the impact of law and order, corruption, and bureaucratic quality on growth. The introduction of the control variables in the next regression analysis (table 9) only accentuates the trends observed in table 8. Law and order, corruption and the quality of the bureaucracy appear to be significant variables that affect growth through time. The most intriguing outcome from the analysis is the fact that law and order is significantly but negatively correlated with growth while contract enforcement is positively but insignificantly correlated with growth. The cross-country growth regressions give some more insight into this intriguing issue.

Table 9. Fixed-effects by year time-series growth regression with control variables

```
Fixed-effects (within) regression               Number of obs      =       382
Group variable (i) : year                       Number of groups   =        11

R-sq:  within  = 0.0703                         Obs per group: min =        34
       between = 0.2566                                        avg =      34.7
       overall = 0.0590                                        max =        36

                                                F(7,364)           =      3.93
corr(u_i, Xb)  = -0.1172                        Prob > F           =    0.0004

------------------------------------------------------------------------------
    gdppcgrw |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     gdppc60 |  -.0004842   .0002142    -2.26   0.024    -.0009053    -.000063
    yreduc60 |   .4538356   .1702216     2.67   0.008     .1190945    .7885767
    laworder |  -.4053431   .2211037    -1.83   0.068    -.8401441    .0294578
       delay |   1.191733    .934787     1.27   0.203    -.6465282    3.029994
     enforce |    .051297   .8700147     0.06   0.953    -1.659589    1.762183
     corrupt |  -.8319317   .2987712    -2.78   0.006    -1.419466   -.2443973
    bureaucq |   .6526269   .2954073     2.21   0.028     .0717078    1.233546
       _cons |   1.173893   .8873858     1.32   0.187     -.571153     2.91894
-------------+----------------------------------------------------------------
     sigma_u |  .90886683
     sigma_e |  4.3935921
         rho |  .04103585   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(10, 364) =     1.40            Prob > F = 0.1793
```

The results obtained when analyzing the country fixed-effects time series regression provide additional ideas how to approach the significance of these

variables on growth. This analysis necessarily drops the control variables because the level of education of 1960 and the GDP per capita in 1960 are constant for the each country across the time series.

Again, corruption is significantly and negatively correlated with growth, implying that this result is consistent with the previous finding. Another important but shocking result is that both law and order and enforcement have now a positive and significant effect on growth. This result is more interesting than the previous one because it is more significant to make a prediction across countries than it is to make a prediction across years. In fact, this result is fully consistent with the cross-country regression analysis identifying key variables in the legal system (see tables 11 and 12).

Another important point is that bureaucratic delay is not significant in either regression, resting weight to the hypothesis that slower bureaucratic apparatuses have an impact (either positive or negative) on overall economic growth, although more empirical work is necessary to come to a conclusion on this issue.

Table 10. Fixed-effects by country time-series growth regression (no control variables)

```
Fixed-effects (within) regression               Number of obs      =       382
Group variable (i) : codenr                     Number of groups   =        39

R-sq:  within  = 0.0480                         Obs per group: min =         1
       between = 0.0001                                        avg =       9.8
       overall = 0.0031                                        max =        11

                                                F(5,338)           =      3.41
corr(u_i, Xb)  = -0.6875                        Prob > F           =    0.0051

------------------------------------------------------------------------------
    gdppcgrw |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     gdppc60 |  (dropped)
    yreduc60 |  (dropped)
    laworder |   .8224569   .3183807     2.58   0.010     .1961998    1.448714
       delay |  -.8171202    2.16905    -0.38   0.707    -5.083657    3.449416
     enforce |   5.120166    1.73132     2.96   0.003     1.714647    8.525685
     corrupt |  -.9997963   .4198266    -2.38   0.018    -1.825598   -.1739943
    bureaucq |  -.1439712   .6038764    -0.24   0.812      -1.3318    1.043858
       _cons |  -7.794266   5.578405    -1.40   0.163    -18.76703    3.178497
-------------+----------------------------------------------------------------
     sigma_u |  3.6480727
     sigma_e |  3.8675079
```

```
         rho |   .4708275   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(38, 338) =     3.94            Prob > F = 0.0000
```

Cross-section growth regression analysis is clearly another important important piece of evidence in the economic development puzzle. All four aspects of the legal system analyzed in table 11 are very significantly and positively correlated with growth. The weight in the regression of expropriation risk (EXPRISK) and property rights (F_PROP97), two correlated but different variables, is higher than the general rule of law (RULELAW) or merely contract enforcement (ENFORCE). As pointed out in the legal analysis, property rights were already defined in the Civil Code of 1958 and the expropriation risk was fairly low for most of the development period, except in the early days of the Park regime. The other variables in the analysis, namely contract enforcement and general rule of law, did not receive as much emphasis as property rights in the Korean legal system. Notice as well that general rule of law has less weight in the equation that the other legal variables analyzed. It seems reasonable that the general rule of law has less weight than other legislation that is specifically designed to promote the basic institutions of capitalism. For example, one of the darkest chapters of the Korean legal system, workers' rights, is part of the general rule of law, but it would not show on the property rights regression.

Table 11. Cross-section growth linear regression on the impact of the legal system

growth	OLS	OLS	OLS	OLS	OLS
R	0.2332	0.3223	0.4597	0.6332	0.6588
Nr. Obs	70	66	41	41	41
school60	.5654803***	.3946867***	.1835172*	.1208037	.096978
gdpsh460	-.0005022***	-.0006381***	-.0008554***	-.0008885***	-.0007961***
f_prop97		.8456423***			
rulelaw			.4522872***		
enforce				.6848681***	
exprisk					.8660617***
Constant	.7716475**	-1.357275*	.8638321*	-.6008158	-2.792267***

Note: *** significant at the 99% level; ** significant at the 95% level; * significant at the 90% level.

Another key but widely ignored issue is the impact of the legal origin on economic growth. Arguably, some legal systems tend to promote economic growth better than others. This hypothesis is, however, hard to prove. There are basically four major legal systems across the world: the English (ENGLISHN) legal system (also known as Common Law), the Scandinavian legal system (SCANDN), the French legal system (FRENCHN) and the German legal system (FRENCHN). Most countries in the world have constructed their legal system based on one of these. Colonial heritage has been perhaps the most natural mechanism of transmission of the legal system, but not the only one. For example, the Japanese decided conciously to adapt the German legal system during the years following the Meiji restoration after 1868. Meanwhile, South Korea inherited its legal tradition from the Japanese during the colonial rule, so its legal system belongs to the German family. The results of these regressions are quite surpring. While the English and Scandinavian system have positive but insignificant effects on growth, the French legal system has a negative and significant at 84% level influence on growth. Yet, the German legal tradition is significant and positive at the 98% level and boasts a beta coefficient three times the size of the French legal system! Furthermore, the interest of this variable is great because it is completely exogenous. Yet the validity of these results is limited by the sample size (seventy countries) and by the fact that only five coutries in the sample have a German legal tradition (Germany, Switzerland, Austria, Japan and Korea). The French and the English system are, on the other side, much more widely spread particularly in developing countries.

Table 12. Cross-section growth linear regression on the impact of the origin of the legal system

growth	OLS	OLS	OLS	OLS
R	0.2332	0.2557	0.2984	0.2340
Nr. Obs	70	70	70	70

school60	.5653174***	.5314455***	.5583997***	.5613532***
gdpsh460	-.000502***	-.0004996***	-.0005478***	-.0005086***
englishn	.0043578			
frenchn		-.5593035		
germann			1.801339**	
scandn				.2113463
Constant	.7699357**	1.153213***	.7750121**	.7871067**

The business-government relationship in South Korea has been studied by numerous scholars (see, for example, Kim EM, 1996). However, the link between the conglomerates and the state and economic growth is much more complicated to estimate empirically. Clearly, a good and clear regulatory system (F_REGU97) should have a positive (and in this case significant) effect on economic growth as reflected in table 13. Yet, monopolistic/oligopolistic behaviour and industrial protection, two well-observed trends in the Korean manufacturing sector, may not necessarily have a negative impact on economic growth. The index of state-owned enterprises (SOE), a group of companies that probably enjoys both trends throughout the world, has a negative but insignificant (and very small) effect on growth. Thus, it is harder to come to any conclusion in this regard.

Table 13. Cross-section growth linear regression on the impact on business-government interaction

DV: growth	OLS	OLS	OLS	OLS
R-squared	0.2621	0.1967	0.2362	0.2108
Nr. Obs	66	37	66	37
gdpsh460	-.0005144***	-.0005159**	-.0005383***	-.0005087**
school60	.4155587***	.2694852	.5901572***	.2243547
f_regu97	.7919269***			.1728506
bureau		.0249569		.0038491
soe			-.0801455	.0722966
cons	-.9262292	2.469912**	1.200446**	1.943735

The impact of governance indicators in the following cross-section (table 14) is less than evident. However, these results may be biased because the growth variable has been averaged over a 35 year period while these governance indicators were specifically gathered for 1997-98.

Table 14. Cross-section growth linear regression on the impact of governance

Dep. Var: growth	OLS
R-squared	0.2633
Number of obs	68
gdpsh460	-.0004675
school60	.5649863
accounta	-.4115057
stabilit	.6511924
governme	-.636148
nocorrup	.3033737
_cons	.649679

Contrary to the results presented by Sala-i-Marti (1998), the average degree of etholinguistic fractionalization (AVELF) comes out to be very significant. The implications for the Korean case are straightforward. Korea's index is one of the lowest in the world because of the complete homogeneity of the Han population and the country wide usage of the Korean language and alphabet. Little ethnolinguistic fractionalization does not only imply a lower degree of domestic political conflict but also high degrees of nationalism and national identity may also be related to this variable. Table 15 also includes the impact of the different religious affiliations on growth although it is harder to reach a conclusion *á la* Max Weber from these figures. An important note is that all religions have negative impacts on growth, while the only religious variable significant at the 10% level is Catholicism (CATHO80). The Protestant variable (PROTMG80) is significant at the 85% level, while the Muslim variable (MUSLIM80) is insignificant.

Table 15. Cross-section growth linear regression on the impact of culture

Number of obs	70
R-squared	0.3606
gdpsh460	-.0004623***
school60	.4467206***
protmg80	-.0146454
catho80	-.0113763*
muslim80	-.0088977
Avelf	-2.342521***
_cons	2.689406***

The impact of different political variables on growth is also hard to grasp. It seems that civil liberties (CIVIL) and the number of revolutions (REVC) are negatively and significantly correlated with growth, although violence measured in terms of assassinations (ASSASS) is not that significant. The regression suggests that a stable regime with limited civil liberties may be growth enhancing, although the coefficient of political instability measured as the average number of revolutions and coups per year[33] has a much more negative impact on growth than civil liberties. This statement has to be made with great care, since limited civil liberties increase significantly the risk of political abuse and corruption, and this may end up creating greater political instability. Korea has actually enjoyed this sort of political regime with one peculiar characteristic: strong property rights and a fairly good legal system. And these variables may actually have the effect of offsetting to some extent corruption and political abuse.

Table 16. Cross-section growth linear regression on political violence and civil rights

growth	OLS	OLS	OLS	OLS
Number of obs	70	70	69	69
R-squared	0.2394	0.2634	0.4154	0.4213
gdpsh460	-.0004996***	-.0005533***	-.0006145***	-.0006192***
school60	.558211***	.5512402***	.3568545***	.3575917***
assass	-.2963571			-.12649
revc		-1.482041*		-.4439608
civil			-.548207***	-.5215685***
_cons	.8714323**	1.197505***	3.471901***	3.505723***

Finally, it is important to remember the geographical location of the South Korean peninsula. Other than being placed in a key geostrategic position sharing borders with China, Japan, and Russia, and being home to 30.000 American troops, Korea is located quite far from the tropic and, as table 17 shows this has a

[33] This indicator averages over the 1960-90 period illegal or forced change in the top governmental elite, any attempt at such a change, or any successful or unsuccessful armed rebellion whose aim is independence from central government.

positive and significant effect on growth (LAT_ABST). As mentioned before, being far from the equator line has other beneficial effects such as lower rates of disease and a greater incentive to "produce for the winter time."

Table 17. Cross-section growth linear regression on the impact of geography

Growth	OLS	OLS	OLS
Number of obs	70	70	70
R-squared	0.3529	0.2886	0.3761
gdpsh460	-.0006999***	-.0005307***	-.0006904***
school60	.4504618***	.5767123***	.471218***
lat_abst	4.411593***		3.921571***
latam		-.7320891*	-.4193055
asianics		.871031	.7483488
Constant	.3528903	.9634797**	.4800899

5. KOREAN ECONOMIC DEVELOPMENT FROM A GROWTH ACCOUNTING PERSPECTIVE

5.1 ESTIMATING TECHNICAL CHANGE

The final part of this paper is devoted to estimating different measures of productivity of Korean economy. The growth accounting exercise in this section relies on a series of strong assumptions. Thus, the following has to hold:

1. Constant returns to scale (the production function is homogeneous of degree 1).
2. Perfect competition.
3. Capital and labour are the only factors of production.
4. Marginal product of capital is equal to r, and marginal product of labour is equal to w.
5. All sectors have identical production functions.
6. Technical change is Hicks-neutral (Y = f(K, L, A) or alternatively Y = A f(L, K))

The departure function is:

[3] $Y = f(K, L, A)$,

where Y is output, K is capital, L is labor and A is technical change. The accounting identity is then

[4] $Y = wL + rK$

where w is an adjusted measure of wage or the marginal productivity of labor and r the return on capital or the marginal productivity of capital. From this accounting identity, we can estimate the return on capital:

[5] $r ? \frac{Y ? wL}{K}$

Going back to our initial production function and our assumptions number 1 and 6, we find that the function can be transformed into

[6] $\log Y = \log A + \log f$

and if we derive with respect to time, we have that

[7] $\frac{\frac{? \log Y}{?t}}{Y} ? \frac{\frac{? \log A}{?t}}{A} ? \frac{\frac{? \log f}{?t}}{f}$

The fundamental equation of neoclassical growth is defined as:

[8] $\frac{\frac{dY}{dt}}{Y} ? \frac{\frac{dA}{dt}}{A} ? \frac{rk}{f}\frac{\frac{dk}{dt}}{k} ? \frac{wL}{f}\frac{\frac{dL}{dt}}{L}$

where $\frac{rk}{f} ? ?$ and $\frac{wL}{f} ? ?$. This equation states that the growth rate of Y is equal to the growth rates of technical change, capital and labour, accounting for the relative income share of the two inputs and $A ? A_0 e^{?t}$. Also,

[9] $? ? \frac{\frac{\dot{K}}{K} ? \frac{\dot{L}}{L}}{\frac{\dot{r}}{r} ? \frac{\dot{w}}{w}}$

The literature in general tries to get around the estimation of the Solow residual by considering gross rather than net output measures. Another way to avoid the inherent bias is to estimate productivity growth rates at the industry level instead

of at the aggregate economy level. Table 18 gathers different productivity estimates of the manufacturing sector in South Korea.

Table 18. Estimates of Total Factor Productivity Growth in Korean Manufacturing industry (based on net value added)

Authors	Periods	TFP	Value Added	TFP/Value Added	Sources
C. Kim and Shon (1979)	1966-75	2.6	25.5	10.2	RMMS
Kim C.K. (1979)	1966-75	2.6	25.5	10.2	RMMS
Kim, Yoo and Hwang (1984)	1967-79	5.5	23.6	23.3	RMMS
Kim and Park (1988)	1966-83	7.0	19.5	36.0	RMMS
S.S. Lee (1988)	1966-83 1973-83	6.15 2.0	18.9 13.6	32.4 15.2	RMMS
Cho (1991)	1971-90	2.1	13.2	15.4	NA
Moon, Cho, Whang and Kim (1991)	1971-89	3.6	12.8	27.6	NA
Pyo, Kong, Kown, and Kim (1993)	1970-90	1.1	8.4	8.4	NA
Pilat (1995)	1967-87	4.3			RMMS
Young (1995)	1966-90	3.0	14.1	21.3	NA
Pyo, H (1995)	1970-92	1.1	12.2	8.9	NA
Kwack S.Y.(1999)	1971-93	3.2	14.2	22.7	NA

Source: this table is borrowed from Kwack (1999).
Notes: NA: National Accounts, RMMS: Report on Mining and Manufacturing Survey

The following estimates (table 19) are also based on the National Accounts, while the capital stock has been constructed using the perpetual inventory method. The average technical change per year for the whole economy is estimated at 1.315, while the absolute rate of technical change is much smaller at 1.025. This residual is quite small for the reference period (1970-2000) and thus supports the hypothesis of little technical change. From these figures, it seems that capital deepening is a crucial piece of the South Korean economic puzzle while technical change does not appear to be a major source of growth.

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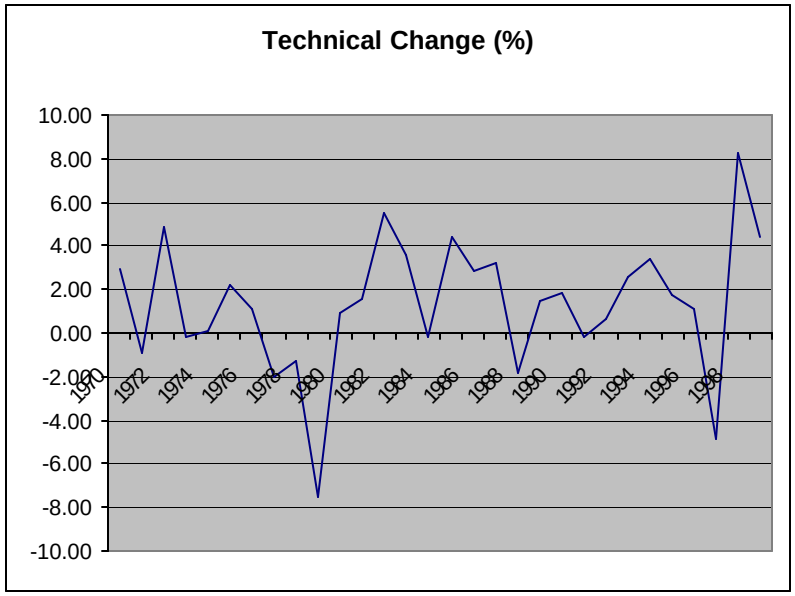
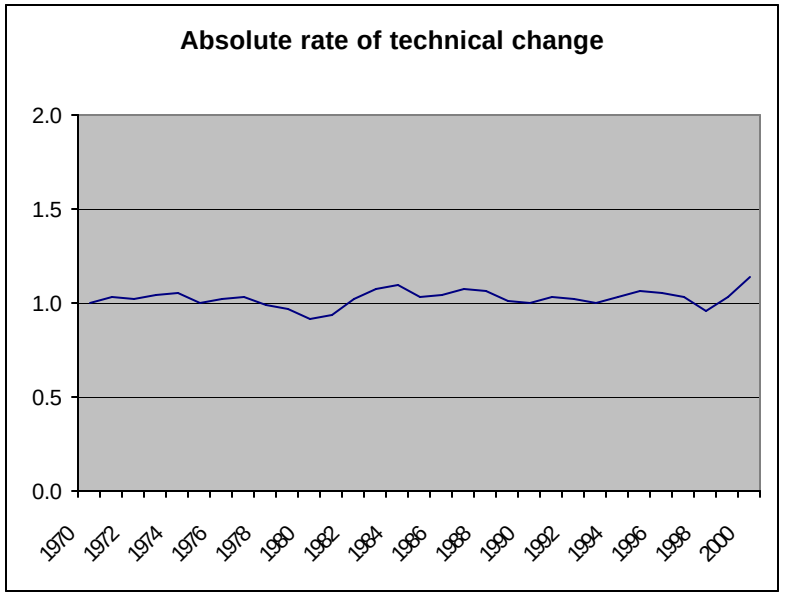
Table 19	Y	K	K/Y	W	L/Y	L	w	Beta	Alpha	Technical Change (%)	r	Sigma	Year	Absolute rate of technical change	Average technical change growth
1970	56209	70939.993	1.262	28,854.0	0.513	9,618	3.00	0.51	0.49		0.39		0	1	
1971	61024.9	76639.394	1.256	30,845.5	0.505	9,946	3.10	0.51	0.49	2.91	0.39	3.681	1	1.03	2.907
1972	64000.9	82162.924	1.284	32,026.0	0.500	10,379	3.09	0.50	0.50	-0.89	0.39	4.267	2	1.02	1.010
1973	71898.1	90004.178	1.252	33,113.3	0.461	10,942	3.03	0.46	0.54	4.86	0.43	0.325	3	1.04	1.323
1974	77212	99222.269	1.285	35,615.4	0.461	11,421	3.12	0.46	0.54	-0.15	0.42	1.018	4	1.05	1.177
1975	82257.5	109036.16	1.326	37,169.9	0.452	11,691	3.18	0.45	0.55	0.12	0.41	2.268	5	1.00	-0.007
1976	91467.7	121461.55	1.328	43,074.7	0.471	12,412	3.47	0.47	0.53	2.16	0.40	0.408	6	1.02	0.380
1977	100621.6	138383.57	1.375	49,833.6	0.495	12,812	3.89	0.50	0.50	1.12	0.37	0.536	7	1.03	0.469
1978	109687.4	162360.59	1.480	57,179.5	0.521	13,412	4.26	0.52	0.48	-2.05	0.32	0.588	8	0.99	-0.117
1979	117434.7	188134.76	1.602	62,898.9	0.536	13,602	4.62	0.54	0.46	-1.27	0.29	0.768	9	0.97	-0.370
1980	114977.7	208989.82	1.818	61,199.9	0.532	13,683	4.47	0.53	0.47	-7.56	0.26	1.319	10	0.92	-0.883
1981	122412.2	227681.93	1.860	63,980.9	0.523	14,023	4.56	0.52	0.48	0.96	0.26	2.837	11	0.94	-0.600
1982	131285.8	248675.74	1.894	70,891.0	0.540	14,379	4.93	0.54	0.46	1.52	0.24	0.498	12	1.03	0.207
1983	145330.6	274232.95	1.887	74,889.9	0.515	14,505	5.16	0.52	0.48	5.50	0.26	9.032	13	1.07	0.540
1984	157318.4	302320.1	1.922	76,908.1	0.489	14,429	5.33	0.49	0.51	3.55	0.27	34.515	14	1.09	0.647
1985	167501.9	330811.1	1.975	84,089.3	0.502	14,970	5.62	0.50	0.50	-0.18	0.25	0.536	15	1.03	0.225
1986	185869	362549.64	1.951	89,103.0	0.479	15,505	5.75	0.48	0.52	4.39	0.27	1.697	16	1.04	0.264
1987	206287.2	400904.66	1.943	99,692.5	0.483	16,354	6.10	0.48	0.52	2.85	0.27	0.790	17	1.08	0.426
1988	227863.9	445029.83	1.953	113,031.0	0.496	16,869	6.70	0.50	0.50	3.25	0.26	0.610	18	1.06	0.339
1989	241725.5	497080.74	2.056	140,532.6	0.581	17,560	8.00	0.58	0.42	-1.84	0.20	0.187	19	1.01	0.074
1990	263430.4	565755.6	2.148	159,701.3	0.606	18,085	8.83	0.61	0.39	1.46	0.18	0.534	20	1.00	-0.019
1991	287737.9	643438.42	2.236	175,885.8	0.611	18,677	9.42	0.61	0.39	1.84	0.17	0.884	21	1.03	0.157
1992	303383.9	716491.9	2.362	193,441.2	0.638	19,033	10.16	0.64	0.36	-0.14	0.15	0.481	22	1.02	0.077
1993	320044.2	792498.9	2.476	205,820.3	0.643	19,328	10.65	0.64	0.36	0.66	0.14	0.835	23	1.01	0.023
1994	346448.1	876624.46	2.530	222,356.2	0.642	19,905	11.17	0.64	0.36	2.54	0.14	1.141	24	1.03	0.133
1995	377349.8	971231.83	2.574	235,440.9	0.624	20,432	11.52	0.62	0.38	3.35	0.15	125.577	25	1.06	0.236
1996	402821.2	1071250	2.659	260,552.1	0.647	20,817	12.52	0.65	0.35	1.70	0.13	0.475	26	1.05	0.194
1997	423006.7	1162982.1	2.749	277,570.6	0.656	21,106	13.15	0.66	0.34	1.09	0.13	0.658	27	1.03	0.103
1998	394710.4	1219396.5	3.089	247,703.0	0.628	19,994	12.39	0.63	0.37	-4.90	0.12	4.597	28	0.96	-0.136
1999	437709.4	1277199.6	2.918	267,471.6	0.611	20,281	13.19	0.61	0.39	8.23	0.13	0.804	29	1.03	0.115
2000	476269.3	1345222.8	2.825	299,845.6	0.630	21,061	14.24	0.63	0.37	4.39	0.13	0.155	30	1.13	0.421
Avg.	**211783.8**	**486410.1**	**1.977**	**123571.533**	**0.548**	**15717**	**7.052**	**0.548**	**0.452**	**1.315**	**0.256**	**6.734**	**15**	**1.025**	**0.310**

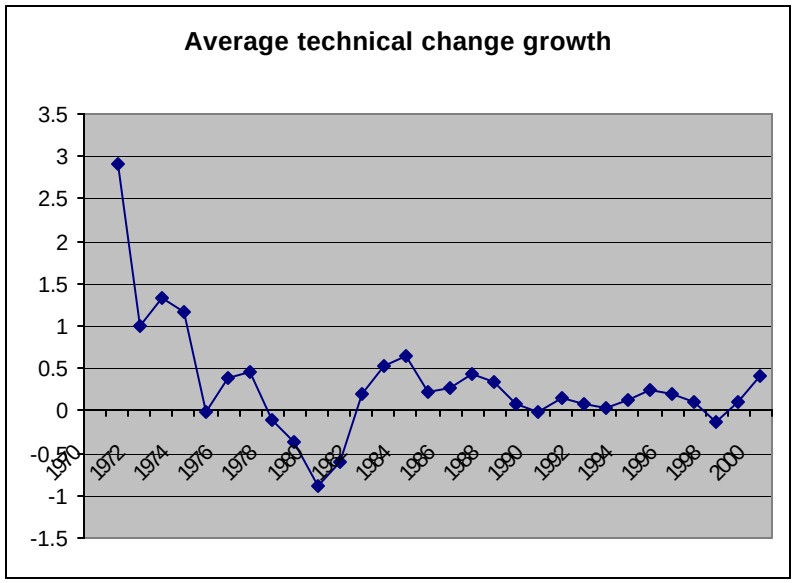
Graph 1. Technical Change in South Korea 1970-2000



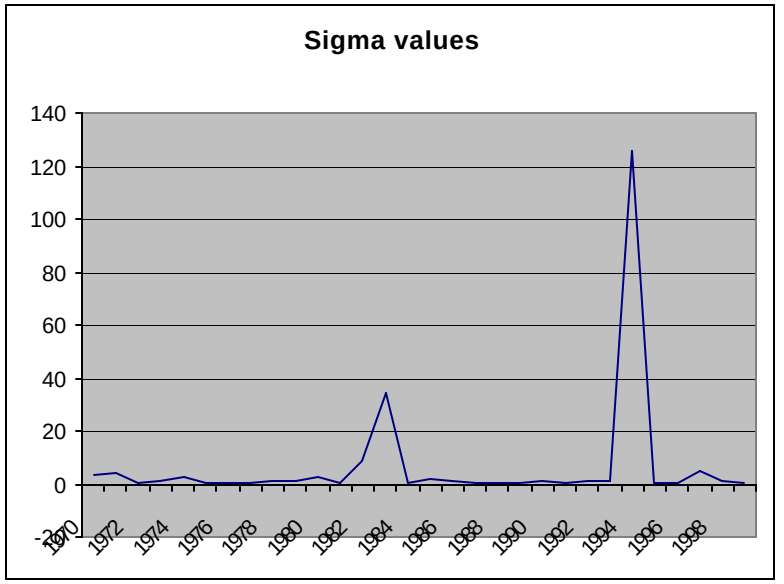
Graph 2. Absolute rate of technical change in South Korea



Graph 3. Average technical change growth in South Korea (1970-2000)



Graph 4. Sigma values for the 1970-2000 period in South Korea



5.2 ESTIMATING PRODUCTIVITY ENDOGENOUSLY

The main problem with the methodology used in the previous exercise is that it left the accumulation of human capital out of the analysis. Neoclassical growth theory initially developed by Solow (1956) stressed savings and physical capital accumulation as the engines of economic growth. Thirty years later, the proponents of the endogenous growth theory, Romer (1990) and Grossman and Helpman (1991), argued that Solow based models could not explain empirically the disparities in the level and growth rates of cross-country per capita incomes and, from a more fundamental standpoint, they argued that the neoclassical growth theory failed to explain the determinants of technological advancement. The growth accounting method ignored the contribution of human capital to both technological progress and factor inputs (namely labor and capital). Thus, it failed to explain where the growth came from. An example of this is that human capital growth may contribute endogenously to physical capital accumulation. As a matter of fact, Benhabib and Spiegel (1994) demonstrated that the level of initial human capital stock is positively correlated with the ex-post accumulation of physical capital[34]. The conclusion that follows is that human capital may have contributed significantly to the capital deepening process in South Korea. The second problem derived from the growth accounting method is that the unexplained residual of output growth is normally attributed to Total Factor Productivity (TFP) growth, otherwise called exogenous technological progress. The assumption of exogeneity is, however, misleading[35] as some of this technological progress may in fact be endogenous. Thus, in this part of the paper, I have used a methodology based on the augmented Solow growth models initially proposed by Mankiw, Romer and Weil (1992).

[34] This was proved in the context of cross-country data.
[35] See, for example, Romer (1990) and Grossman and Helpman (1991) for the theoretical basis of the endogenous theory.

The point of departure in this model is a homogeneous production function

[10] $Y = F(X_1, X_2, X_3, ..., X_n, t)$

Alternatively, we can start from an exponential production function:

[11] $Y = A\, L^{?/2}\, K^{?/2}\, H^{1-?}$

where Y is output, L is labor, K is the capital stock, H is the human capital stock and ? is an indicator of factor weight[36]. From this equation, we can reach the rate of TFP growth:

[12] $?A/A = ?Y/Y - (?/2)\,?L/L - (?/2)\,?K/K - (1-?)\,?H/H$

The contribution of each of the factors to growth is calculated in the following way:

[13] $Physical\ \ Capital\ ? \left(\frac{K}{L}\right)^{?}$

[14] $Human\ Capital = H^{??}$

[15] $TFP\ ? \dfrac{\frac{Y}{L}}{\left(\frac{K}{L}\right)^{?} H^{??}}$

The data used in the analysis is the following:

- Output Growth: The basic output measure is Gross Domestic Product in national prices of 1987.

- Physical Capital: The measure of the capital stock is based on a perpetual inventory estimation with a common geometric depreciation rate.

- Labor Inputs: The measure of the quantity of labor is actual employment for the industrial countries and estimates from the International Labor Organization of the economically-active (labor force) population for the others.

- Human capital: It is a quality adjusted measure of the quantity of education. The original figures for Korea are taken from Bosworth and Collins (1996), and in turn their calculation is based on the Barro-Lee data set.

[36] I have assumed that ? =0.65

Following the methodology of Bosworth and Collins (1996), I find slightly different estimates. There are a couple of problems with the data used by these researchers. First, the initial stock of physical capital used in the calculations was taken from the "total physical capital" figures estimated by Nehru and Dhareshwar (1993) [37]. This estimate is already taking into account the depreciation of the stock of capital. For this purporse, Nehru and Dhareshwar (1993) use the perpetual inventory method[38]:

[16] $K_t = I_t + (1-?)K_{t-1}$

where K_t is the stock of capital in year t, ? is the depreciation rate (generally set at 5%), and I_t is the investment for year t . However, Bosworth and Collins (1996) redepreciate the stock of physical capital from the original estimates, implicitly decreasing the role of capital in the calculation of Total Factor Productivity estimates. A second problem is that the researchers do not use the readily available GDP figures from Nehru and Dhareshwar (1993). The divergence between the World Bank data and the Nehru and Dhareshwar (1993) data set may be primarily due to the adjustment of GDP figures to constant local currency units in different years. Thus, using the GDP estimates (GDP at market prices) from the same data set as the total physical capital data can help to reduce a potential estimation error. Again, total factor productivity growth is small and only accounts for about 1% of the growth. Similarly, the growth in the stock of human capital stands at about 1% as well, while the capital deepening hypothesis gains weight by claiming 2.7% of the growth over the sample period.

[37] Nehru, Vikram, and Ashok Dhareshwar. 1993. "A New Database on Physical Capital Stock: Sources, Methodology and Results." Revista de Analisis Economico 8 (1): 37-59

[38] Basically, this method departs from a base capital stock. The base capital stock is typically anywhere between 0.5x and 3xGDP, but in this case it is taken from the estimates of Nehru and Dhareshwar (1993). Then, the capital stock is depreciated at a constant rate, typically between 3% and 10% depending on the type of capital good (a usual figure for the economy as a whole is 4%). To this depreciated capital stock, one has to add the gross domestic fixed investment. In the case of South Korea, the original capital stock as a percentage of GDP ranges from 0.62 in 1953 to 2.29 in 1990.

Table 20. Total Factor Productivity Estimates

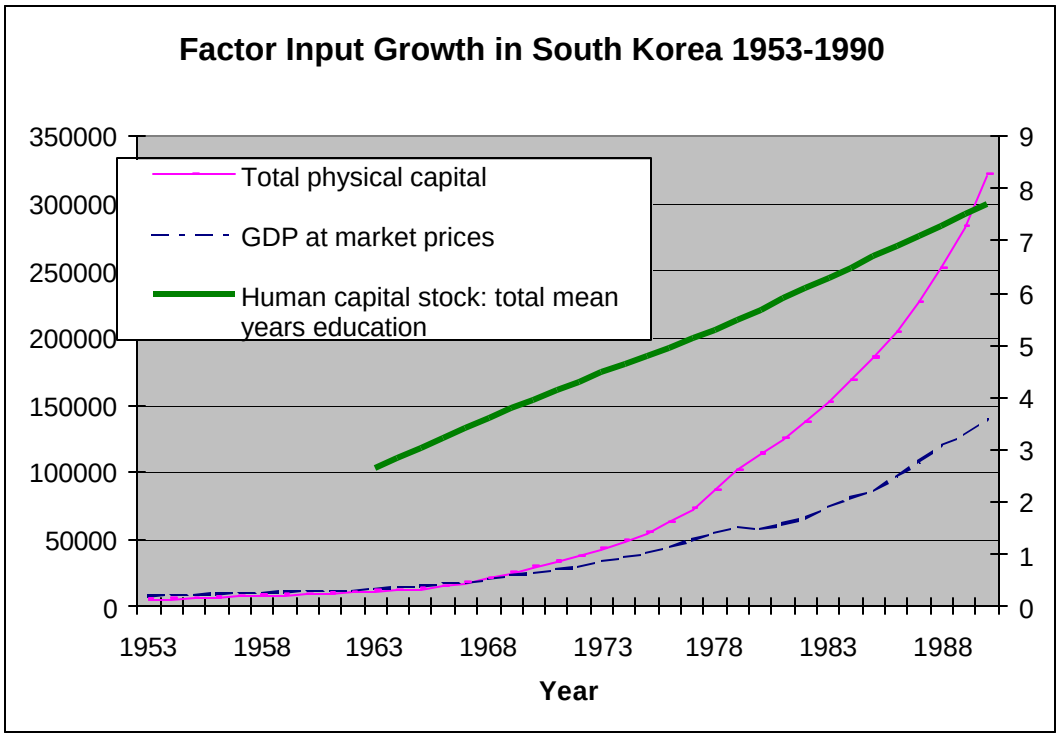
Results								
Output/worker			Contribution of					
Year	Y/L	?(Y/L)	Capital	?K	Education	?Ed	TFP	TFP Growth
1970	1.000		1.000		1.000		1.000	
1971	1.050	0.050	1.015	0.015	1.015	0.015	1.018	0.018
1972	1.055	0.005	1.025	0.009	1.031	0.015	0.999	-0.019
1973	1.124	0.066	1.039	0.014	1.046	0.015	1.035	0.036
1974	1.157	0.029	1.059	0.019	1.061	0.015	1.030	-0.005
1975	1.204	0.041	1.086	0.025	1.076	0.014	1.031	0.001
1976	1.261	0.047	1.104	0.017	1.089	0.012	1.049	0.018
1977	1.344	0.066	1.143	0.035	1.102	0.012	1.067	0.018
1978	1.399	0.041	1.189	0.041	1.114	0.012	1.056	-0.011
1979	1.477	0.056	1.246	0.048	1.127	0.011	1.052	-0.004
1980	1.438	-0.027	1.290	0.035	1.140	0.011	0.978	-0.070
1981	1.494	0.039	1.318	0.022	1.147	0.006	0.988	0.011
1982	1.562	0.046	1.348	0.022	1.154	0.006	1.005	0.017
1983	1.714	0.097	1.390	0.032	1.161	0.006	1.062	0.057
1984	1.866	0.088	1.441	0.037	1.168	0.006	1.108	0.044
1985	1.915	0.026	1.468	0.019	1.175	0.006	1.109	0.001
1986	2.051	0.071	1.498	0.020	1.187	0.010	1.154	0.040
1987	2.158	0.052	1.523	0.017	1.198	0.009	1.183	0.025
1988	2.311	0.071	1.562	0.026	1.209	0.010	1.223	0.034
1989	2.355	0.019	1.601	0.025	1.221	0.009	1.205	-0.015
1990	2.492	0.058	1.658	0.036	1.232	0.009	1.220	0.012
1991	2.636	0.058	1.715	0.034	1.243	0.009	1.237	0.014
1992	2.727	0.035	1.769	0.032	1.254	0.009	1.229	-0.006
1993	2.833	0.039	1.823	0.030	1.265	0.009	1.229	0.000
1994	2.978	0.051	1.869	0.025	1.276	0.009	1.248	0.016
1995	3.160	0.061	1.920	0.027	1.288	0.009	1.279	0.024
1996	3.311	0.048	1.974	0.028	1.299	0.009	1.292	0.010
Average growth		0.047	=	0.027	+	0.010	+	0.010

Note: this table breaks down the growth in production (Y) per worker into three different components (physical capital, human capital or education and TFP growth). One column accounts for the cumulative stock of the variable while the other gathers the percentage change over the previous year.

Graph 5 gives an idea of how important physical capital growth has been. While the growth in the human capital stock could be probably defined by a linear

equation, the growth in physical capital stock is exponential. It even grows very aggressively during the economic slowdown of the early eighties.

Graph 5. Factor input growth in South Korea 1953-1990



Note: figures in years (right axis) and billion won (left axis).

5.3 GROWTH ACCOUNTING IN THE CONTEXT OF KOREA

Why is the capital accumulation story so appealing in the case of South Korea? If we look at the different factors of production over a twenty or thirty year period we find that capital grew very impressively in this Asian country. For example, in 1990 the capital stock was 31.2 times larger than the capital stock in 1961. In contrast, the same growth figure in the educational index used by Bosworth and Collins (1996) was only 1.43, while the comparable growth in labor force was 2.31. In terms of schooling, the number of years of education grew by 2.926 times in the

1971-96 period, while the contribution to growth of human capital[39] was only 1.299. In sum, unless we use a high discount factor for the schooling quality, it seems clear that the increase in capital stock was by far the largest contributor to economic growth in the 1961-90 period.

Looking at productivity, the estimates in table 20 indicate that the contribution of TFP to growth was only 1.29 compared to a contribution of capital of 3.31. In fact, some authors have found significant inefficiencies in some sectors of the Korean economy. For example, in a comparative study Okuda (1997) reveals significant inefficiencies in the Korean manufacturing sector prior to 1986. Table 20 reflects that, during the heavy and chemical industry drive, TFPG was negative in four out of nine years.

Another useful exercise may be to put the capital stock growth figure in comparative international perspective. As a percentage of GDP, the stock of capital in South Korea went from 0.804 in 1961 to 2.206 in 1990. The Japanese case is similar and the capital stock as a percentage of GDP went from 1.007 in 1961 to 2.268 in 1990. On the other hand, the same figures for the US are 1.813 for 1961 and 2.125 for 1990, indicating that the growth of the capital stock in the US was much smaller during that period[40]. Ueda (2000) uses a stochastic growth model to determine optimal investment behavior and suggests that market forces do not explain the rise in investment rates in the 1960s and 1970s. This is consistent with the capital accumulation hypothesis of Korean economic growth. As I have shown, the growth of the capital stock is spectacular. Yoon (1999) explains that, as fixed set up costs increase, the number of active entrepreneurs decreases while risk-neutral entrepreneurs tend to adopt riskier technologies, thus increasing

[39] Some important factors have been, however, omited from the human capital estimates of Bosworth and Collins. For example, the role of multinational enterprises has been very relevant in the development of South Korea's electronic industry (Cyhn, 2000). Korean companies have participated and learned through inter-firm agreements with multinational corporations called Original Equipment Manufacturing (OEM) arrangement. This is obviously not register in the human capital development index, but the question remains: where is it?

volatility in total output growth. A similar argument may be made for the financing of entrepreneurial ventures in South Korea, although the moral hazard introduced by the government when bailing out conglomerates has probably contributed to intensify this trend. Under severe moral hazard induced by bailout policies and no competition law in line with industrial policies, Korean entrepreneurs may have opted to over invest in fixed capital formation and to leave most of the human capital formation to the state and to individual families.

Lee JM (1997) suggests that Korean infant industries have tended to mature while under protection, and also shows that output grew faster in infant than in mature industries, thus supporting the revisionist arguments that enhance the role of government intervention. On the other hand, Lee JW (1995) investigates the impact of industrial policy in South Korea and concludes that trade protection reduced both the growth rates of labor productivity and total factor productivity over the 1963-83 period, thus having a negative impact on growth.

However, according to Hahn (1999), low unemployment in Korea is closely linked with high labor productivity over the past two decades. The key factors supporting this inverse relationship are capital accumulation, better education, and high aggregate demand. Hahn further claims that half of the labor productivity growth is actually attributed to an increase in the capital stock. Meanwhile, Mamgain (1999) finds that high rates of growth of manufacturing translate into high productivity rates in Korea.

Lee, Kim and Heo (1998) argue that productivity growth has been dominated by technological change rather than by technical efficiency change, and this may account for the low TFPG figures found by several studies (including this one). On the other hand, Drysdale and Huang (1997) find that productivity improvement was a key element of East Asia growth using model based on purchasing power parity adjusted inputs.

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[40] These calculations are based, for the Korean case, on the same datasets used in the calculation of the TPF figures. The Japanese and US estimations are based on rough data provided by Prof. Ryuzo Sato of New York University.

To close the discussion, it is important to note that the agricultural sector may have pushed the productivity calculations down for the whole economy. Contrary to the conventional view, Ramachandran (1996) compellingly argues that most of the growth in the agricultural sector in South Korea took place in the pre-war period, way before industrialization started. According to this author, agricultural development preceded industrial development. This is consistent with my own preliminary calculations of agricultural productivity that indicate little growth in output during the last thirty years, although can not explain the large increase in agricultural machinery investment over the 1970-2000 period.

In sum, I conclude that human capital and labor productivity have contributed much less to growth than physical capital in the Korean case, and that the total factor productivity increases have been, at most, moderate over the development period.

6. CONCLUSION

This paper has explored the different sources and hypothesis on South Korean economic growth. I have also estimated empirically both the explanatory variables of growth and the impact of physical and human capital and productivity increases on economic growth.

In the first empirical exercise, I have shown that the legal, political, cultural and institutional analysis of economic growth brings about several important conclusions that specifically apply to the Korean case. In the first place, that the early protection of property rights and, to a lesser extent, contract enforcement, was extremely important in achieving ex-post growth. Secondly, Korea has benefited from having a very succesful legal tradition from an economic perspective: the German legal system. In the third place, political stability has also been crucial over the development period. Fourth, the uniform composition in terms of race and language has also favored Korea.

In the second empirical exercise, I have estimated factor productivity growth using the Solow growth model as well as an endogenous growth model. In both cases, total factor productivity growth estimates are moderate. Moreover, the role of capital accumulation is extremely important in both cases while in the second case the growth in human capital is moderate. A criticism is that the human capital stock measure of Bosworth and Collins is only a measure of the years and the quality of formal education. Thus, it is not capturing additional educational externalities derived from the technology transfer and training agreements that Korean companies may have had with multinational corporations[41].

Korea is, in sum, not only one of the most successful economic growth stories of the past century but also one of the most intriguing ones. After taking a close look at the political economy of South Korean development is hard to accept the neoclassical view, although I do admit some of its arguments. I find, however, the revisionist theses quite plausible and in fact quite compatible with the capital accumulation story of Young because, as every economist knows, an insured investor tends to take excessive risks and to over-invest. Government-controlled credit markets together with government-sponsored corporate bailouts induced a great deal of moral hazard in the system, thus converting the Korean economy into some sort of "real option," a lot to win and little to loose. Korean entrepreneurs have been, in a way, insured and spoiled capitalists that have benefited from a unique political, institutional, legal and cultural climate. After all, "in human life, economics precedes politics or culture."

[41] See Amsden (1989) for a full explanation of how Korean engineers learned from multinational corporations on site.

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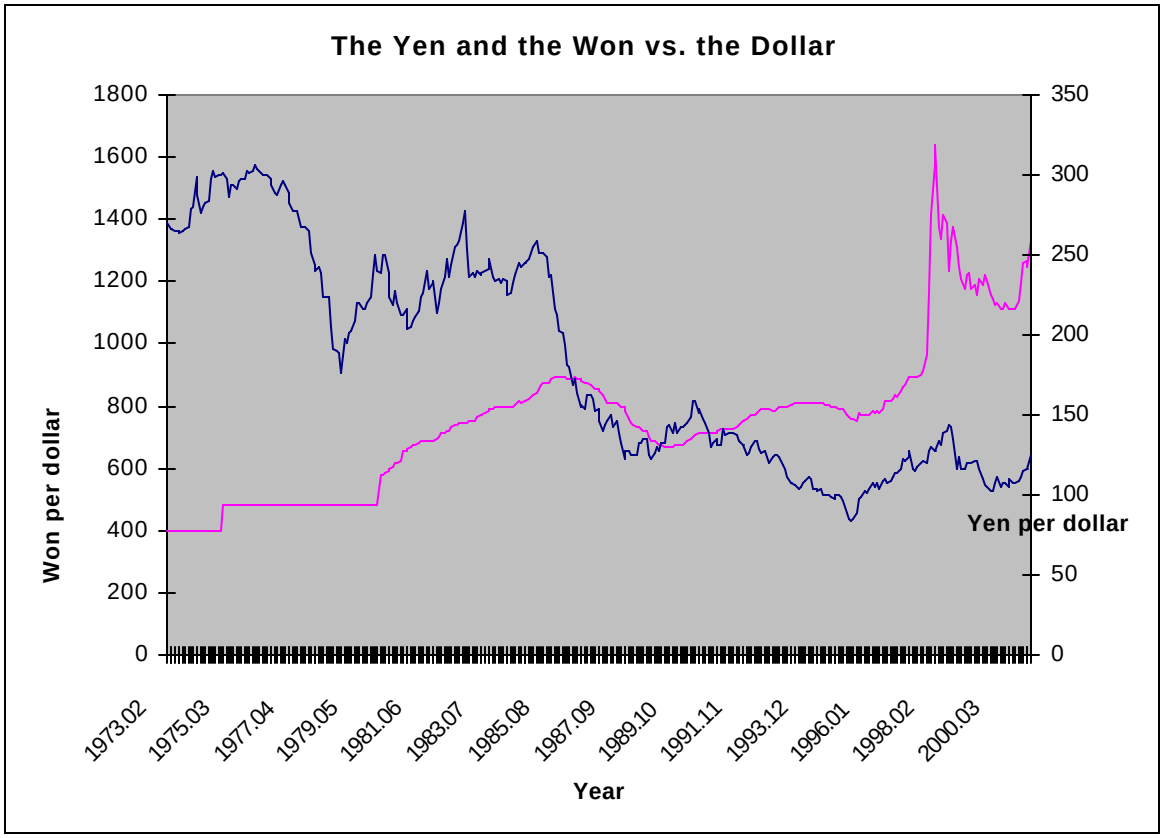
APPENDIX 1

ADDITIONAL GRAPHS

Graph 6. Behaviour of the Korean won and the Japanese yen against the dollar.



Source: Bank of Japan and South Korean National Statistical Office

APPENDIX 2

SOURCES OF DATA FOR THE GROWTH REGRESSIONS

A. Worldwide Governance Research Indicators Dataset, World Bank

***Characteristics of the data set*:** Cross-section of 173 countries. The data used to create these indicators is mostly for 1997-98. Continuous variable indexes ranging from 0 to 5.

Quality of Regulation: measures the incidence of market-unfriendly policies and perception of the burdens imposed by excessive regulation

Accountability and Voice: measures the extent to which citizens of a country are able to participate in the selection of governments.

Government Effectiveness: perceptions on the quality of public service provision, the quality of the bureaucracy and the competence of civil servants.

Political Instability and Violence: measures perceptions of the likelihood that the government in the power will be destabilized or overthrown by possibly unconstitutional and / or violent means

No Corruption: measures perceptions on the lack of corruption.

Rule of Law: measure the extent to which agents have confidence in and abide by the rules of society.

B. Business Environment Risk Intelligence (BERI) and International Country Risk Guide (IRCG) datasets.

Characteristics of the datasets: a time series of 80 countries for 16 years (1980-1995), although many countries do not have data for the first five years (1980-84) for several variables.

Law and order (IRCG): An index of the quality of law enforcement. It is a discrete index ranging from 0 to 6.

Bureaucratic delay (BERI): Continuous index ranging from 0 to 4.

Contract enforcement (BERI): Continuous index ranging from 0 to 4.

Quality of the bureaucracy (IRCG): Discrete index ranging from 0 to 6.

Corruption (IRCG): Discrete index ranging from 0 to 6.

C. Freedom House Dataset

Characteristics: Available on-line www.worldaudit.org. As opposed to previous datasets, lower scores mean more liberties / rights etc.

Civil Liberties: Discrete index ranging 1 through 7

Political Rights: Discrete index ranging 1 through 7

Press Freedom: Continuous index ranging 1 through 100

Corruption: Continuous index ranging 1 through 100

D. Polity IV Project

Several datasets that include indicators of democracy and autocracy, authority characteristics, and regime transitions.

E. The 2000 World Development Indicators CD-ROM

This CD-ROM contains over 500 social and economic indicators for all countries from 1960 through 1998.

F. Levine-Loayza-Beck Data Set (World Bank Group on Economic Growth)

This data set is available for download at the World Bank Research group on economic growth webpage (www.worldbank.org / research / growth). The variables I have included in the analysis are the following:

- *Revolutions and Coups* A revolution is defined as any illegal or forced change in the top governmental elite, any attempt at such a change, or any successful or unsuccessful armed rebellion whose aim is independence from central government. Coup d'Etat is defined as an extraconstitutional or forced change in the top government elite and / or its effective control of the nation's power structure in a given year. Unsuccessful coups are not counted. Data are averaged over 1960-90

- *Assassinations:* Number of assassinations per thousand inhabitants. Data are averaged over 1960-90.

- *Ethnic fractionalization*: Average value of five indices of ethnolinguistic fractionalization, with values ranging from0 to 1, where higher values denote higher levels of fractionalization.

- *Bureaucratic efficiency*: Average of three indices published by Business International Corporation (1984): efficiency of the judiciary system, red tape and corruption. The data are averages over the period 1980-83.

- *Property rights*: Rating of property rights on a scale from 1 to 5. The more protection private property receives, the higher the score.

- *Cost of business regulation*: Rating of regulation policies related to opening and keeping open a business. The scale is from 0 to 5, with higher scores meaning that regulations are straightforward and applied uniformly to all businesses and that regulations are less of a burden to business.

- *Risk of expropriation*: Assessment of risk of "outright confiscation" or "forced nationalization". It ranges from 0 to 10, with lower scores indicating a higher risk and data are averaged over 1982-1995.

- *Religious Composition*: Percentage of the population that were (1) Roman Catholic, (2) Protestant, and (3) Muslim in 1980.

Table 21. Countries Used in Time Series Regressions

1.Argentina	21.Egypt, Arab Rep.	41.Kenya	61.Senegal
2.Australia	22.El Salvador	42.Korea, Republic	62.Seychelles
3.Austria	23.Ethiopia	43.Malaysia	63.Singapore
4.Bahrain	24.Finland	44.Mali	64.South Africa
5.Belgium	25.France	45.Mauritan	65.Sri Lanka
6.Belize	26.Gabon	46.Mexico	66.Swaziland
7.Benin	27.Germany	47.Moldova	67.Sweden
8.Bolivia	28.Greece	48.Nepal	68.Switzerland
9.Brazil	29.Guatemala	49.Netherlands	69.Syrian Arab R.
10.Burundi	30.Guyana	50.New Zealand	70.Tanzania
11.Canada	31.Haiti	51.Niger	71.Thailand
12.Chile	32.Honduras	52.Nigeria	72.Togo
13.Colombia	33.India	53.Norway	73.Turkey
14.Congo, D (Zaire)	34.Indonesia	54.Panama	74.Uganda
15.Congo, R	35.Ireland	55.PapuaN.Guinea	75.United Kingd.
16.Cote d'Ivoire	36.Israel	56.Paraguay	76.United States
17.Cyprus	37.Italy	57.Peru	77.Uruguay
18.Denmark	38.Jamaica	58.Philippiness	78.Venezuela
19.Dominican Rep.	39.Japan	59.Portugal	79.Zambia
20.Ecuador	40.Jordan	60.Saudi Arabia	80.Zimbabwe

Table 22. Correlations between independent variables used in the time series regressions and growth

	gdppcgrw	gdppc60	yreduc60	laworder	delay	enforce	corrupt	bureaucq
gdppcgrw	1.0000							
gdppc60	-0.0060	1.0000						
yreduc60	0.0871	0.8263	1.0000					
laworder	-0.0671	0.2804	0.1496	1.0000				
delay	0.0548	0.1811	0.1851	0.5803	1.0000			
enforce	0.0578	0.2836	0.3245	0.5828	0.8927	1.0000		
corrupt	-0.0602	0.2712	0.2197	0.6728	0.7447	0.7188	1.0000	
bureaucq	0.0310	0.3668	0.2738	0.6673	0.7323	0.7443	0.7868	1.0000

Table 23. Countries Used in Cross-Section Regressions

1.Argentina	25.Guyana	48.Panama
2.Australia	26.Haiti	49.Papua New Guinea
3.Austria	27.Honduras	50.Paraguay
4.Bangladesh	28.Iceland	51.Peru
5.Barbados	29.India	52.Philippines
6.Belgium	30.Ireland	53.Portugal
7.Bolivia	31.Israel	54.Senegal
8.Brazil	32.Italy	55.Sierra Leone
9.Canada	33.Jamaica	56.South Africa
10.Chile	34.Japan	57.Spain
11.Colombia	35.Kenya	58.Sri Lanka
12.Costa Rica	36.Korea, Rep.	59.Sweden
13.Cyprus	37.Liberia	60.Switzerland
14.Denmark	38.Malaysia	61.Syrian Arab Rep.
15.Dominican Republic	39.Malta	62.Thailand
16.Ecuador	40.Mauritius	63.Togo
17.El Salvador	41.Mexico	64.Trinidad and Tobago
18.Fiji	42.Nepal	65.United Kingdom
19.Finland	43.Netherlands	66.United States
20.France	44.New Zealand	67.Uruguay
21.Germany	45.Niger	68.Venezuela
22.Ghana	46.Norway	69.Zaire
23.Greece	47.Pakistan	70.Zimbabwe
24.Guatemala		

Table 24. Correlations between legal variables in the cross-country growth regressions

	growth	school60	gdpsh460	f_prop97	rulelaw	enforce	exprisk
growth	1.0000						
school60	-0.0546	1.0000					
gdpsh460	-0.3088	0.7984	1.0000				
f_prop97	0.3854	0.7037	0.5676	1.0000			
rulelaw	0.1582	0.6963	0.7695	0.7479	1.0000		
enforce	0.2380	0.7122	0.7581	0.7685	0.9819	1.0000	
exprisk	0.3181	0.6859	0.6972	0.7231	0.9079	0.9562	1.0000
englishn	-0.0130	0.0047	-0.1207	-0.0636	-0.1817	-0.1845	-0.1315
frenchn	-0.2566	-0.2995	-0.1557	-0.3266	-0.2032	-0.2415	-0.2628
germann	0.3607	0.1016	0.1280	0.3722	0.2333	0.3010	0.3076
scandn	0.0423	0.3695	0.3080	0.2257	0.3678	0.3602	0.3021

	englishn	frenchn	germann	scandn
englishn	1.0000			
frenchn	-0.6325	1.0000		
germann	-0.2928	-0.3086	1.0000	
scandn	-0.2582	-0.2722	-0.1260	1.0000

Table 25. Correlations between cultural and religious variables in the cross-country growth regressions

	growth	gdpsh460	school60	protmg80	catho80	muslim80	avelf
growth	1.0000						
gdpsh460	0.1269	1.0000					
school60	0.3719	0.8178	1.0000				
protmg80	-0.0103	0.5116	0.4447	1.0000			
catho80	-0.0483	-0.0015	-0.0404	-0.3994	1.0000		
muslim80	-0.1872	-0.3340	-0.4205	-0.2355	-0.4033	1.0000	
avelf	-0.3957	-0.4376	-0.4494	-0.1042	-0.2608	0.3073	1.0000

Table 26. Correlations between growth and political variables

	regulato	growth	gdpsh460	school60	assass	revc	civil
regulato	1.0000						
growth	-0.0490	1.0000					
gdpsh460	0.1882	0.1769	1.0000				
school60	0.1824	0.4112	0.8194	1.0000			
assass	0.1035	-0.1158	-0.0768	-0.1039	1.0000		
revc	0.0708	-0.2898	-0.3725	-0.3439	0.4703	1.0000	
civil	-0.0870	-0.5134	-0.6990	-0.7137	0.0830	0.4922	1.0000

APPENDIX 3

Table 27. Data Used on the Growth Accounting Exercise

Year	Y	K	H	L	Y/L
1970	1	1	1	1	1
1971	1.0528	1.0498	1.0157	1.0601	0.9932
1972	1.0804	1.1233	1.0321	1.0894	0.9917
1973	1.1737	1.2255	1.0479	1.1184	1.0495
1974	1.2828	1.3099	1.0643	1.1471	1.1183
1975	1.3596	1.4272	1.0800	1.2102	1.1235
1976	1.5193	1.6408	1.0750	1.2394	1.2259
1977	1.6157	1.9072	1.0700	1.2682	1.2740
1978	1.8023	2.2870	1.0650	1.2969	1.3896
1979	2.0532	2.7646	1.0600	1.3635	1.5059
1980	2.2360	3.2287	1.0550	1.3928	1.6054
1981	2.4597	3.6908	1.0800	1.4221	1.7296
1982	2.6032	4.1393	1.1050	1.4917	1.7451
1983	2.9996	4.7132	1.1300	1.5218	1.9712
1984	3.2660	5.3724	1.1557	1.5937	2.0492
1985	3.5161	6.0694	1.1807	1.6249	2.1639
1986	3.9906	6.9143	1.2029	1.6945	2.3551
1987	4.4298	8.0317	1.2243	1.7211	2.5738
1988	4.9142	9.5691	1.2464	1.7923	2.7419
1989	5.2801	11.1998	1.2679	1.8197	2.9017
1990	5.1064	12.5551	1.2900	1.8944	2.6955
1991	5.4573	13.7788	1.3021	1.9241	2.8363
1992	5.8592	15.1416	1.3150	2.0018	2.9269
1993	6.5654	16.7818	1.3279	2.0315	3.2318
1994	7.1715	18.5997	1.3400	2.1058	3.4056
1995	7.6675	20.4667	1.3529	2.1267	3.6054
1996	8.6106	22.5466	1.3729	2.1962	3.9207
1997	9.6122	25.0411	1.3929	2.2171	4.3355
1998	10.6943	27.8452	1.4136	2.2893	4.6715
1999	11.3838	31.2231	1.4336	2.3114	4.9252
2000	12.4429	35.4947	1.4543	2.3900	5.2062