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COULD NEW GROWTH CROSS-COUNTRY EMPIRICS EXPLAIN THE SINGLE COUNTRY GROWTH OF SYRIA DURING 1965-2004?

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Could New Growth Cross-Country Empirics Explain the Single Country Growth of Syria during 1965-2004?

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Abstract

The goal of this paper is to examine, whether the results of new growth cross-country empirics (Barro-type model) match the results of growth accounting exercise in Syria, during the period 1965-2004.

To deal with this matter three main steps are followed. The first is, using cross-country growth empirics to find out the determinants of economic growth in developing countries. Secondly, individual country growth accounting is used to examine the sources of growth in Syria. Finally a test measuring to what extent the results of cross-country model match those of the Syrian individual country analysis is undertaken.

The main results of this paper are:

- The main determinants of growth in developing countries are domestic investment, initial income, initial human capital, quality of institutions, government consumption, inflation, openness and political instability, respectively.
- The main engines of growth in Syria are physical and human capital accumulation and labor growth, whereas the contribution of the total factor productivity is too low.
- Some results from the cross-country empirics are helpful in explaining the growth in Syria such as domestic investment. However, some other factors don't seem to play their expected role. For instance, the relatively high growth rate in Syria is associated with poor institutions, a large size of government and a closed economy, which are considered main deterrents of growth according to cross-country empirics. Therefore, the results of cross-country growth empirics contradict, to a certain extent, with the results of country specific growth accounting in the case of Syria.

ملخص

تهدف هذه الورقة إلى معرفة مطابقة النتائج التي أسفرت عنها التجارب الحديثة للنمو في عدة دول (نموذج نوع بارو) من ناحية ونتائج اختبار المحاسبة للنمو في سورية في الفترة بين 1965 و2004.

وللتعامل مع هذا الأمر يجب اتباع ثلاث خطوات: الأولى هي استخدام تجارب النمو في عدة دول لمعرفة محددات النمو الاقتصادي في الدول النامية. ثانيا: استخدام محاسبة النمو لكل دولة على حده لمعرفة مصادر النمو في سوريا. وأخيراً عمل اختبار لقياس مدى مطابقة نتائج النموذج في عدة دول لنتائج التحليلات الخاصة بسوريا.

والنتائج التي وصلت إليها الورقة هي كما يلي:

- المحددات الرئيسية للنمو في الدول النامية هي الاستثمارات الداخلية والدخول الأولية والثروة البشرية الأساسية ونوعية المؤسسات والاستهلاك الحكومي والتضخم والانفتاح وعدم الاستقرار السياسي على التوالي.

-محركات النمو في سوريا هي تراكم الثروة البشرية ونمو مستوى العمالة إلا أن إسهام العامل الكلي للإنتاجية ضعيف للغاية. وبعض النتائج المستقاه من تجارب في عدة دول تساعدنا في تفسير النمو في سوريا مثل الاستثمار الداخلي هناك إلا أن هناك عوامل أخرى لا تلعب دورها المرتقب على ما يبدو. فمثلاً معدل النمو المرتفع نسبيا في سوريا تصاحبه مؤسسات ضعيفة وتضخم في الجهاز الحكومي كذلك واقتصاد مغلق، وهي عوامل تعتبر مثبطات للنمو تبعاً للتجارب المستقاه من عدة دول. لذا فإن نتائج تجارب النمو في عدة دول تتناقض، إلى درجة معينة مع محاسبة النمو المحددة في حالة سوريا.

1 Introduction

1–1 Preface

Economic growth is the main target of every country. It is a necessary, yet not a sufficient condition to improve welfare. What is more, to achieve the goal of triggering and sustaining economic growth rates, sources of economic growth need to be examined. Hence, a considerable amount of economic literature has been allocated to the economic growth field, both on the theoretical and the empirical levels.

One fact about the history of economic growth is the difference in the economic growth rates between countries, which is a lively part of the research area. Many economists and econometricians have been spending enormous efforts during the last two decades, to answer the question "Why does growth differ between countries?"

On the other hand, the neither the economic growth theory nor new empirics could fully explain economic growth miracles like the South East Asian countries and Botswana or economic growth disasters such as African Sub-Saharan countries. As a result, the research on the country level has gradually been developing to understand the individual case of each country. Also, the research on the country level has given significant feedback to cross-countries growth empirics to take more factors into consideration when dealing with economic growth regressions.

The question of whether cross-countries growth empirics could provide a valid explanation of growth determinants for an individual developing country has been the inspiration for this research.

1–2 Aims and Objectives

The main question of this research paper is: To what extent could the cross-country new growth empirics explain the growth determinants in SYRIA as a developing country?

Cross-country new growth empirics are widely used to explain economic growth in developing countries for many reasons. Trying to generalize the theory of economic growth on developing countries and the power of panel data methods that solve many econometric problems is just one of the reasons. As a result, many economists build their economic growth research on cross-country empirics, instead of country case studies. Therefore, this paper raises the question of the appropriateness of using the "popular" cross-country results for specific country growth cases. In addition, the case of Syria is interesting because of its achieving sustained economic growth during the period 1965-2004.

In this context the paper will focus on these questions:

1-What are the main determinants of growth in the developing countries?

2-What are the sources of growth in Syria by using growth accounting techniques?

3-What are the main determinants of Total Factor Productivity Growth in Syria?

4-To what extent does the Syrian economic growth analysis match the results of the cross countries empirics in questions 1 above?

1–3 Methodology

Different methods of quantitative approach have been used in this research in the different models introduced in chapter two as follows:

In section 3-1 Cross Countries Difference Growth Model of Barro and Sala-I-Martin (2004) (Barro-type, henceforth), which aims to define the determinants of the economic growth, is used. This type of model is a useful tool to understand the difference in economic growth rates between developing countries. The advantage of this model is the flexible framework

that gives researchers the opportunity to test the relationship between different factors and growth rates.

The econometric problem of cross-country regressions is heterogeneity, endogeneity, measurement error and regional spillover. However, panel data give the best solutions to the problems of omitted variables which are constant over time (like initial level of technology). In addition, there is an ability to use lags as instrumental variables to deal with endogeneity and measurement error biases (Temple, 1999). Furthermore, no endogeneity problem was found in the model which makes the OLS method the best least unbiased estimator. Despite that, 2SLS method results have been reported.

Section 3-2 presents the Syrian economic growth analysis using different methods. To start with, descriptive analysis is implemented to analyze for the trend of growth and the structure of the Syrian economy, in addition to the contribution of individual sectors to the economic growth. Secondly, we apply the growth accounting approach to find out the main sources of growth in Syria through the following steps:

- Estimating the capital stock in Syria during the period 1965-2004 following the Perpetual Inventory Method approach which has been widely used to estimate the capital stock in the economic growth literature.
- Estimating the depreciation rate following (Hofman, 2000) using the weighted investment categories depreciation rates (residential, non residential and equipments).
- Building the labor time series from the Penn World (Table 6.1).
- The labor elasticity is estimated through calculating the average share of wages of income with the assumption that this elasticity is fixed. This elasticity is then disaggregated to two parts. The first is the share of minimum wages in the total income which reflects the elasticity of labor. The second is the difference between the average and minimum wages which reflects the price of human capital (education and experience) (Rodrik, 2003).
- The elasticity of physical capital is the residual of one minus the sum of the elasticities of labor and human capital since we use the constant rate of returns (Cobb-Douglas) production function.
- Calculating the Total Factor Productivity Growth (TFPG, henceforth) as a residual which is not explained by the relative growth rate of physical capital or labor and human capital.

To analysis the TFPG, an ad hoc regression is implemented using the growth rate of agriculture and a dummy for political instability as the explanatory variable. Finally, to see to what extent the results of the cross-country Barro-Type could enable us to understand the growth in a specific county, we compare the results of the cross-country models with the results of the Syrian economy analysis for the period 1965-2004.

1–4 Data

There are two main sets of data which have been built for the purpose of this research:

Data Used for Panel Data in the Barro-Type Model:

The data for this research is built from the World Developing Indicators 2006. Eighty five developing countries are chosen for the sample depending on three criteria: developing, availability of data (so most of the Soviet Union and the Eastern Europe is excluded) and excludes countries that depend heavily on oil, namely the gulf countries (see appendix 1). Following is the time series for each country from 1965 to 2004 divided into 8 five years periods: 1965-1969, 1970-1974, 1975-1979, 1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004.

The variables used, GDP per capita (constant 2000 US$), population growth (annual), and gross domestic investment (as % of GDP), are taken from the World Development Indicators

2006. The average years of schooling for the population over age fifteen – from Barro and Lee (2000) – is taken as a proxy for the human capital level.

The main resources for environmental and controlled variables are taken from Roodman (2004), Easterly et al (2000) and Burnside and Dollar (2000).

Data for the Syrian Economy Analysis

Most data is taken from the National Bureau of Statistics and State Planning Commission in Syria, in addition to international sources such as the Human Development Report 2005.

2 Literature Review

2–1 New Growth Empirics

Economic growth empirics have become popular since the influential work of Barro (1991). Moreover, the weak link between the growth theory and the real world has spurred ad hoc empirical work to understand determinants of growth particularly after the growth theory failed to predict or analyze the growth miracle of South East Asia and Botswana.

In an attempt to understand the underlying mechanism for growth, three growth empirics areas have evolved. the first concentrates on the difference in income levels between countries (which is beyond the scope of this research), the second focuses on the difference between growth rates in developing countries, and the last one is the single country growth analysis.

2–1–1 The Difference in Cross-Country Growth: New Growth Empirics

Insufficient answers to the main growth questions pushed the empirical and the theoretical sides to evolve together. The empirical economists attempt to find the determinants of the growth and also to explain the reasons for the variation of this growth between developing countries. Furthermore, these empirics attempt to test the impact of the main factors like investment, initial conditions, human capital, public policies and institutions, geography, fertility, population and religion on growth (Barro, Sala-I-Martin, 2004).

The Initial Conditions: The Initial Human Capital and Income

Life expectancy and education, as proxies for human capital, have an important effect on growth (Barro, Sala-I-martin, 2005). The high initial human capital leads to faster growth in the future, which supports the increasing returns of human capital suggested by (Lucas, 1988, Benhabib and Spiegel, 1994)

The initial income has a negative relation with growth when all other growth determinants are controlled. This result supports the conditional convergence.

Social Infrastructure (institutions and government polices)

Social infrastructure is the institutions and the government polices that control the economic climate in which people work, invest and initiate in. According to Jones (1999), the social infrastructure affects the level of income and helps with understanding the difference in productivity levels of workers, but it does not affect the growth rate on the long run.

However, the main matter in institutions is the definitions and measurement. that the definitions vary from too wide one by North(1990) “as the formal and informal constraints on political, economic, and social interactions” to narrow one which consider institutions as governance (Kaufmann et al 2007) and define governance as "the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies and the respect of citizens and state for the institutions that govern economic and social interactions among them". Nevertheless, regarding the practical

availability of indicators to measure institutions quality, recent literature has been using the governance indicators of (Kaufmann et al 2007) or ICRG indicators. However, these indicators are regarded as subjective measurements of institutions, which might not measure their quality precisely. Moreover, some of these measurements confuse the functions of institutions (which could be common between countries) and institutions forms, which vary widely across countries according to its history, social capital, and policies (Chang 2007). As a result, the institutions quality indicators will be used in the research keeping the above reservations in mind while translating the results.

On the other hand, many institutional studies about suggest the positive impact of good institutions on productivity, and hence, on growth rate (Rodrik, 1994, Barro, Sala-I-martin, 2004). Moreover, institutions have an important role in triggering and sustaining growth and thus should adapt with country specifics to find creative solutions relevant to each individual country (Rodrik, 2003).

On the other hand, Knack and Keefer (1995) provide an important indicator of institutions' quality which consists of the equal weight of five elements: law and order, bureaucratic quality, corruption, risk of expropriation and governmental repudiation of contracts. This indicator has been widely used in growth empirics (see Easterly, 2003, Barro 2004, Burnside and Dollar 2000)

One of the important issues in the institutions is the causality, according to (Acemoglu et al, 2002) the good institutions lead to better economic growth. Moreover, the bad institutions cannot blame the macroeconomic policies for bad performance since they have the ability to damage the economy even if the macroeconomic policies are good. Furthermore, (Rodrik et. al 2004) have considered institutions as the main source of growth on the long run but contrarily some economists claim that good institutions are the result of growth and human capital level (Glaeser et al, 2004).

Moreover, the difference in growth rates of transitional economies can be explained by the difference in institutions quality which has been affected by the dependency on the natural resources and the years of socialism which deteriorate the institutions (Beck, Thorsten. Laeven, Luc. 2006).

Government Polices

Government spending on infrastructure has a positive impact on growth (Temple, 1999) and this expenditure has a crowding- effect on private investment. Besides, the public investment in human capital such as health and education increases the productivity of the private investment (Agénor, 2004). Furthermore, the role of macroeconomic policies in achieving stabilization is important for economic growth. On the other hand, high inflation for instance, has a negative impact on productivity and stock of capital.

Physical Capital

The physical capital has a positive effect on growth rates. Moreover, the investment share of GDP and the growth rate of investment affect the growth rate positively. However, the diminishing rate of returns leads to the decreasing importance of capital as it reaches its steady state (Agénor, 2004).

Size of Government

High level of government consumption may be harmful through reducing the level of income (Hall and Jones, 1999, Temple, 1999). Moreover the main reason of the negative impact of the size of government, especially in the developing countries, is government's inefficiency and corruption.

Openness

According to the endogenous theory, the openness is important for growth since it helps in importing technology which consequently leads to higher economic growth. Moreover, the openness creates larger markets especially for the small developing countries. (Sacks and Warner, 1995) have built an index for the openness depending on the ratio of customs, non-tariff barriers, government's control of the main exports and type of regime (if it socialist or not); they conclude that the relation between growth and openness is strong. However, the causality between trade and growth is ambiguous. The more a country specializes in manufacturing exports, the more beneficial the openness (Temple, 1999). In general, openness in developing countries leads to limited benefits due to the low technology, the low comparative advantage and the dependence on raw materials for exports (Agénor, 2004).

2–1–2 Growth accounting: Country Growth Empirics

Studying individual countries helps to understand the main determinants in the growth on the long and short run and also the reasons for the miraculous and disastrous growth of many economies.

The main approach is the growth accounting following Solow (1957); this approach has many shortcomings such as the difficulty of choosing the right production function, the weak data on capital stock, the structure of the workers and wages. Furthermore, the assumption of the constant-elasticity-of-substitution (CES henceforth) production function has many shortages. Although, the Cobb-Douglas production function – as special case of the CES – has been criticized (Duffy**,** Papageorgiou, CH, 2000), it is the most popular production function (Dornbusch and Fischer, 2004) which helps through calculating just one coefficient , the elasticity of the capital to income and the other will be the subtraction of capital elasticity of one. The assumption underlining this method is the perfectly competitive markets so each factor of production receives its marginal productivity.

On the other hand, some have used the translog production function (Christensen *et al.,* 1971, 1973, Young, 1995, Hu, Khan, 1997). However, the collinearity (Agénor, 2004) is one of the problems in choosing translog production function, besides that the translog function needs a precise estimation of the elasticity of the capital and labor.

The alternative approach is to calculate the parameters by estimating them econometrically but this approach has many problems due to the omitted variables and the stationarity problems. On the other hand, new approach using nonparametric technique to test the production function (IWATA et al, 2003).

Total Factor Productivity

Much research on the total factor productivity (TFP) has been done on developing countries starting with Solow's study on TFP in the United States. The results show that more than 50% of the economic growth in the USA during 1900-1950 is TFPG which represents the technological progress. Conversely, many recent studies in developing countries have concluded that the TFPG is not the major contributor to growth. Further, factor accumulation and the structural shift in resources towards the productive sectors are the main sources of growth in the developing countries (Young, 1994, 1995, Senhadji, 2000).

On the other hand, others argue that these results are not precise, (Klenow and Rodriguez-Clare, 1997), and (Easterly and Levine, 2000). They emphasize the importance of the technology for growth in the long run. The main reason for such different results is the different techniques used in estimating the elasticity of capital. Moreover, there is trend to underestimate the contribution of physical capital in output in developing countries.

On the regional level, the important work of (Makdisi et al 2003) in growth accounting emphasizes the low contribution of TFP in growth in the MENA region. However, Syria was not in the sample. On the other hand, they estimate the capital elasticity through regressing the output per worker, which is in many countries AR (1), on the capital stock per worker, which is in many countries AR (2), which might lead to spurious results. On the other hand, the cross country regression they use cross section. However, panel data has been used in this paper which has much more advantages.

3 Cross Country Empirics versus Country Growth Accounting on Syria

3–1 Cross Country Growth Model: Barro-type

3–1–1 Background

As a main part of understanding the growth mechanism, this section will deal with the determinants of growth across countries. This process could clarify the unexplained part of the growth process in developing countries.

The theoretical framework of the Barro-type model is still ambiguous. The contribution of the main production factors, the initial physical and human capital are used. However, the other variables which affect growth are still ambiguous.

Many empirical studies try to find out the main determinants of growth and the results vary widely. For instance, many studies have named governmental policies an important influence (Temple, 1999). Others concentrated on the role of R&D and ideas (like Aghion and Howitt, 1998). Some concentrated on institutions (Rodrik, 1994, 2003) (Haussmann et al 2005) (Acemoglu et al, 2002), on political instability (Sacks and Warner, 1997) and on culture and ethnicities (Sala-I -martin 1997, Barro, 1991, 1995, 2005)

In this paper the variable has been chosen to cover the main factors which affect the growth.

3–1–2 The Model Specification

The framework of the model is flexible (Barro et al, 2004)

$$gy_t = F(y_{t-1} + h_{t-1} + ...)$$

Where gy_t is the growth rate of GDP, y_{t-1} is the income at the initial time,

h_{t-1} is the initial level of human capital is the omitted variables which will be tested using controlling and environmental variables explained below.

This study follows Barro Sala-I-Martin, 2004 and Easterly in the definitions of the variables. Also, the chosen model set the most important variables which may explain the growth as follows.

3–1–2–1 The Variables

The Initial Conditions

Two main initial conditions are used as main determinates of growth rates. Firstly, the log of the initial income (Log **GDPPC** (t-1)) and secondly, the reciprocal of initial life expectancy at birth as a proxy of the initial level of human capital. (Barro and Sala-I-Martin, 2004)

In addition, another measure of the human capital, the average years of schooling for the population over 15 years of age (SCHOOL), is used, but not as an initial condition, to specifically measure the impact of human capital on growth (Barro and Lee, 2000).

Controlling and Environmental Variables

- The institutions: The quality institutions lead to enhancing environment to trigger the growth and sustain it. The measure for the institutions quality (**ICRGE**) indicator has been used (Knack, and Keefer, 1995) updated by Roodman (2004).
- Government consumption: The main argument against government consumption in the developing countries is that it leads to corruption and inefficiency in the economy, which leads to a negative impact on growth. The measure (**GOVC**) is the government consumption as a percentage of GDP.
- Openness: Many claim that openness increases the market size and permits importing the technology which positively affects growth. However, the causality is not obvious. The measure used is the **SCAW** (Sacks and Warner, 1995).
- Investment: Investment positively affects growth positively. The measure used (**GDI**), is investment as a percentage of GDP
- Inflation: Macroeconomic policies affect economic growth through many channels, mainly stabilization. Inflation is considered an important indicator of stabilization which negatively affects growth. The measure used is **INFL**= log (1+inflation) following (Easterly et al, 2000).
- Political instability: Political instability negatively affects growth. The proxy used is the assassination measure **(ASSAS)** (Easterly et al, 2000).

3-1-2-2 Robustness

Testing for Endogeneity

With suspect of the endogeneity especially for the ratio of investment to the GDP and the government consumption, testing for the endogeneity is carried out using the lag of investment ratio for the period 1,2,3,4 following Barro and Sala-I-Martin (2004) and using the trade to GDP, log of population and life expectancy and the other explanatory variables in the regression as its self instruments like the institutions variable, and initial income. Moreover, the results of the second stage least squared method has been reported in Table 1.

The results do not reject the null hypothesis that the government consumption and investment ratio are exogenous so the best method which is most consistent for the regression is OLS. The second test is using the Hansen C statistics which reject the endogeneity. Moreover, OLS robust for the heteroskedasticity and using clusters to avoid auto correlation.

Moreover, within the OLS method two models have been used, both of them use fixed effects method. However, the first one with time period dummies and the second one uses time period and counties dummies as a LSDV.

3−1−3 The Regression Results

As seen from Table 1, the three methods report the same sign of the assumed determinants of growth, with one exception, that is the openness index SACW in the 2SLS method with a negative sign and an insignificant coefficient.

On the other hand, when country dummies are added in Model 2, the initial life index, assassination and institutions variables become insignificant probably due to the impact of country-dummy which catches the features of countries like institutions, traditions and initial life conditions.

On the third model 2SLS, most of the variables are insignificant. Moreover, the two suspected endogenous variables, investment and government consumption, have the same sign of the LSDV with less value of investment` coefficient and higher for government consumption.

Lastly, since the evidence of endogeneity is not strong in Model 3 and adding the country dummies in Model 2 seems to absorb the institution's impact which is an integral part of our analysis**,** the analysis below will be build on model 1(least squared time period dummies, (Table 2)

The Initial Conditions

- Initial income: The relation is significant and the sign refers to the existence of conditional convergence in developing countries however it is slowly process toward the country steady state. The increase of one standard deviation of the initial capital will reduce the growth rate by 0.0559.
- Initial Life: The second initial condition is the life expectancy at the initial period which is significant and positive, since the variable is the reciprocal of the life expectancy, so the negative sign means that the more the country has good health conditions the more it could grow in future. This result disagrees with the convergence concept and agrees with the endogenous theory that the more the country has human capital the more it could absorb and filter the technology and then grow in increasing growth rate, like the experience of the South-east Asia. Here the decrease of one standard deviation leads to increase the growth by 0.0553 which seems similar to the relative importance of the initial capital, but in the opposite direction. In the end, the highly importance of the life expectancy comes from the complicated factors behind it.

Controlling and Environmental Variables

- Investment GDI: It has positive sign and significant. From table 3 the increase of one standard deviation in investment ratio leads to increase in the growth rate by 0.07. The important side of the investment in the developing countries is that it is public investment, especially in the education health and the infrastructure which refers to the potential externalities on the private investors. On the other hand, the private investment is the major player in the productive and the service sides, which leads to the conclusion that the governments in the developing countries still have an important tool, to trigger the growth through enhancing the private investment and by its own investment in the infrastructure. Nonetheless, the investment in general is playing important role in the developing countries
- The institutions ICRGE: It has a positive sign and is significant. The increase of one standard deviation in the institution quality indicator leads to increase in the growth rate by 0.0297. That gives new verify for the increasing concentrating on the importance of the institutions in the growth of the developing countries.
- The government consumption GOVC: The government consumption is significant and negative which reflects the inefficiency and the inequality of the government. Corruption appears mainly in this field through the government purchasing and contracts. Reduction the government consumption leads to increase the growth by 0.029
- Openness SACW: the indicator of the openness (Sacks and Warner, 1995) between 0 and 1 and measures if the countries have non-tariff barriers, if it is socialist, the government monopoly the main exports and other factors. Furthermore, the openness plays important role in the growth significant and positive, with question about causality.
- Inflation INFL: the inflation coefficient is highly significant and negative. That means it plays an important role in decreasing the growth. One standard deviation in the log of the price level cause decrease in the growth rate by 0.0224, that is support for the importance of the macroeconomic polices in general and stabilization target in particular.
- Political instability ASSAS: Assassination is negative as expected; however, it is not significant which reveals the question about the appropriateness of this variable as a proxy of the political instability.

- The dummies: The dummies all of them are negative and significant which refer that the growth is decreasing steadily through the time although most of the other factors like polices and institutions and human capital are increasing.

In sum, for the developing countries in the sample, the main result could be obtained:

- there is a slow conditional convergence.
- Human capital (life expectancy) is important and has increasing returns.
- Physical investment is important in the growth.
- Institutions play important role.
- Government consumption affects growth negatively.
- Macroeconomic policy (here inflation rate) is matter.
- Openness is important for growth. However, there is suspicious about the causality.

3–2 Economic Growth in Syria 1965-2004: Growth Accounting

3–2–1 The Specifics about Syria:

Syria is a central planning country with diversification economy in terms of the structure of GDP, however, the exports are heavily depending on the raw materials mainly fuel. Furthermore, the resources of public revenue depend on oil revenue at large extent. The size of government is large according to the ratio of public expenditure to the GDP. Moreover, it is characterized as high military expenditure due to the hot conflicts in Middle East, High population growth, poor institutions in terms of the good governance indicators of the World Bank. After all, it had sustained growth more than 5 % in the period 1965-2004, according to Haussman et al study (2005). Syria have had three sustained growth periods (2.5% growth for eight years) in 60`s and 70`s and 90`s.

3–2–2 Background

The studies about the Syrian economy are very rare due to the severe lack of data; however, recently there is direction toward more transparency in the reform process.

This section aims to analyze the main sources of growth in Syrian economy and test the results of the cross countries regression from section one and two to see, *to what extent these regressions could help to understand the growth resources in single developing country SYRIA in this contest.*

The first step in the analysis is to implement the growth accounting technique to figure out the main resources of growth in the period 1965-2004, mainly, the analysis of the contribution of the accumulation of the production factors versus the total factor productivity. After that, it will be testing the ability of the section one and two results (MRW, Barro types) to see if these results could explain the Syrian economic growth. Moreover, an ad hoc regression of the determinants of the TFPG has been used to help in understanding the growth long run sources.

Furthermore, the second part of analysis try to diagnose of the Syrian economy in terms of the structure change and investment and quality analysis of the main potential resources of growth which are result from the second section (the cross growth empirics) to judge the validity of such techniques on the country level.

3–2–3 Growth in Syria

The average growth rate of Syrian economy is 5.26% during the period 1965 -2004 which could be considered high economic growth comparing with developing and developed countries, using the World Development Indicators data base WDI, this growth rank at 27 out of 186 countries growth for the same period. However, the population growth 3.1% is one of the highest in the world, ranked 16 out of 186 countries for the same period 1965-2004.

On the other hand, the growth in Syria is highly fluctuated the average standard deviation of growth is 8.9 which reflect the highly sensitivity of this growth.

As it could be shown in figure (1) that the growth rate has become less fluctuated. Moreover, the population growth has been reducing dramatically during the period 1985-2004.

Furthermore, the relative high growth in Syria has not depended on the growth of one or two sectors, on contrary it could be seen from the table that the growth rate of the non-oil GDP is 5.13% and for the non-oil and non-agricultural GDP is 5.59%. Thus, the growth in Syria is not just results of abundant in the natural resources or raw materials.

3–2–4 GDP Structure

The Syrian economy has a diversified GDP structure in terms of sectors. In addition**,** it could be noticed from figure 2 that main sectors on average during the period 1965-2004 of the Syrian economy are the agriculture 27% and the manufacturing 13% and mining 7% and trade 21% and others. Thus the economy does not depend on one or tow sectors which give it more ability to absorb the external and unexpected shocks.

The main change in the structure as is shown in figure 2 decreasing in the share of agriculture and manufacturing and increasing in the mining share during 70`s. on the other hand, manufacturing and electricity and transportation increased in 90`s while the trade and constructing decreasing in the same period. Finally, mining decreased during 2000-2004.

This change in structure does not represent improvements in the structure toward manufacturing "productive sector" .although there is reduction in the agriculture but on the other side there has been increase in the mining "rent sector"

3–2–5 The Growth Contribution of Sectors

The sectors' contributions in the growth rate provide more evidence of the diversification of the Syrian economy. On average agriculture contributes by 21%, trade by 21%, each of transportation and government services by 12 % and each of mining and manufacturing by 11% (Table 3). One the one hand this is considered healthy evidence, however, growth is heavily dependent on low productivity sectors like agriculture, mining, trade and government services which may explain a part of growth fluctuation in Syria.

For a more in depth look at productivity, we turn to factors which affect the TFPG. The next question we attempt to answer is what are the determinants of productivity growth in Syria?

3–2–6 Growth Accounting:

3–2–6–1 Choosing the Production Function:

The translog production function was used especially in the 70`s and more recently in Young, 1995. However, the main restriction for the translog is the need to precisely estimate the elasticity of capital, labor and the human capital, which is a difficult task to achieve in the developing countries and the other restriction is the collinearity within the model (Agénor, 2004)

Most of the recent studies use the Cobb-Douglass production function due to the only one parameter need to estimate. However this is not necessarily the right choice to explain the production

Using the Cobb-Douglass function

$$Y_t = K_t^{\alpha} H_t^{\beta} \left[A_t L_t\right]^{1-\alpha-\beta} \qquad 0< \alpha+ \beta <1$$

where H is the stock of human capital, Y_t is the output, K_t the capital and $A_t L_t$ the level of technology for one labor which is called effective labor. Also, α is the elasticity of capital to output. And β is the elasticity of human capital to output.

To build the time series of the variables and to estimate the parameters, specific methods and assumptions is used for each as follows.

3–2–6–2 Capital Stock:

The Perpetual Inventory Method to estimate the capital stock is used using the formula

$$K_t = (1-\delta)^t K_0 + \sum_{i=1}^{T} (1-\delta)^{t-i} I_i \quad \text{.....(1)}$$

K_0 is the initial capital stock, K_t the capital stock in year t, δ the annual depreciation rate of capital and I_i the investment in year i.

Firstly, the *time series of the investment* in fixed price using the national data is built. Secondly, the *initial capital* (K_{1965}) is estimated by dividing the average of the (1965-1966-1967) investment on the sum of growth rate of the investment ***gi*** during 1965-1974 and the depreciation rate **δ**. (Jones, 2002)

$$K_{1965} = \frac{(I_{65} + I_{66} + I_{67})/3}{gi + \delta}$$

Thirdly, the estimation of depreciating rate. The estimation of the depreciation depends on disaggregating the investment in the period 1965-2004 with the assumption that the life of residential capital is 50 years, non residential 40 years and equipment and machines 15 years (Hofman, 2000). Then the weighted depreciating rate is calculated (6.2%) which is in line with results which estimate depreciation to be between 4 and 6 % in developing countries.

As a result, by substituting the investments series, the initial capital and the depreciation rate in formula (1), the capital stock series is estimated (Appendix, 2).

3–2–6–3 Labor and Human capital:

The series of labor is taken from PENN World Table 6.1 since the national statistics on labor are not consistent and the population series is not the right representative of labor due to demographic changes and unemployment. Furthermore, the average school years of population over age 15 years is taken from (Barro, Lee, 2000)

3–2–6–4 Elasticities:

Holding the assumptions of perfect competition and the contribution of each production factor equal to its share in income, the elasticity of the labor is estimated. Moreover, the wage share of income is calculated for the period 1992-2002. Using the assumption that the share of wages is fixed, the results are generalized for the whole period. Thus, the average share of labor is 48% of income.

Moreover, the elasticity of the human capital is considered the part of labor contribution that stems from the education and experience of workers. The human capital contribution could be expressed, following (Rodrik, 2003), as the difference between the average wages and the minimum wages, with the assumption that the minimum wages are the price of labor work without education or experience. Furthermore, the average minimum wage in Syria is about 50% of the average wages. Thus, means that the elasticity of the human capital in Syria is 24%and the labour elasticity is 24%. Finally, the contribution of physical capital is one minus

the contributions of labor and human capital, which is 52% of the national income under the assumption of constant rate of returns for all factors.

3–2–6–4 Total Factor Productivity Growth (TFPG):

These results are in line with estimations for the capital elasticity of physical capital for developing countries in the first section of this paper. One reason for this might be the extremely low wages in the developing countries which do not represent the real price of work. Also, the large informal sector let the estimation of the wages in the developing countries unsoiled.

Referring to Appendix 3, the growth of capital series, labor and human capital are used to calculate the total factor productivity growth through the formula

$$TFPG = \alpha gK + \beta gH + (1 - \alpha - \beta)gL - gY$$

Where **TFPG** of the growth of total factor productivity **gK** is the growth of the stock of physical capital, **gL** is the growth of labor, **gY** is the GDP growth and **gH** is the human capital growth. Also, α, β, and (1- α-β) are the elasticities of capital, human capital and labor respectively.

The results of the TFPG are interesting; the average growth of TFPG during the period 1965-2004 (0.44) is just 8% of the total growth rate of GDP for the same period[1]. These results support the point of view which considers the factors' accumulation as the main source of growth in developing countries.

Moreover, figure (3) shows the high volatility of the TFPG, around an average close to zero. This might not exactly reflect the growth of technology which is considered the ultimate source for growth. In response to these results, many questions arise about the validity of the economic growth theory and the cross-country results which were presented in sections one and two.

The first is why does TFPG fluctuate so much?

Using simple ad hoc regression, which has been created for the sake of this regression, a dummy variable is added to represent the political instability laking values between 0 and 1. The value of 1 is for war or such external economic restrictions, internal revolution or huge violence, and zero otherwise. Two wars took place in 1967 and 1973 and political changes occurred in 1966, 1970, 2000. Internal violence was witnessed between 1982 and 1984. Moreover, Western and international restrictions were applied in 1986.

The other variable is the growth rate of agriculture which highly fluctuates due to the dependency on the rain to the extent that 80% of the agriculture land is not irrigated. Figure (4) shows the strong relation between the TFPG and the growth of agriculture.

It can be seen from Table (4) that the correlation is strong and explains 77% of the TFPG. Agriculture growth has a positive sign and is significant whereas the political instability is negative and also significant. Thus, it can be concluded that the TFPG is affected by shocks not by technological progress.

It could be concluded that technological progress has not played an important role in the "sustained" growth in Syria. Also, the analysis of the economic structure above shows that Syria has not experienced major sector structure change. Thus, the TFPG does not explain the high growth, and it is factors accumulations in line with results of (Young 1994, 1995). On

[1] Note that with sensitivity test of alpha (capital elasticity to output), it maybe noticed that if alpha is 0.42,0.52 and 0.62, then the contribution of TFPG in growth will be 13%, 8% and 4% respectively. These results confirm the weak contribution of TFPG in Syria during the period 1960-2004.

the other hand, the negative impact of political instability could be explained by the weak institutions which reduce the ability of the economy to resist the shocks. Thus, the weak institutions could explain the high volatility of growth in the Syrian economy.

3–2–7 Testing for Validity of Barro-Type Model in explaining Syrian Growth

According to the results presented in section two, the main factors that significantly determine growth are: the initial income and the government consumption positively, and the inflation rate negatively. What is more, the initial life expectancy at birth, the quality of institutions, investment and openness also affect growth positively.

Investment:

The capital in Syria is the main source of growth according to growth accounting. Moreover, the investment ratio in Syria in the period under study is relatively high at 23% of GDP, which could explain a part of the economic growth. This results are in line with the results of the Barro-type model in section two. However, the other side of these results – that 57% of the total investments between 1965-2004 are public investment – suggest that the public policy, through public investment plays a positive role in the growth of capital investment in general, which is in line with results of (Elbadawi, 1996).

Furthermore, it could be seen through a simple correlation scatter between public and private investment that the relation is not linear. Because of that relation it could not be judged if it is a crowding-in or a crowding-out relation. Furthermore, breaking down the public investment to investment in infrastructure, human capital and production could help in future in depth analysis to explain sources of complementarity between public and private investment, (see for instance Agénor et al 2005).

Human Capital:

Although there has been a dramatic improvement in human capital in Syria since 1965, Syria ranked 111 out of 173 on the human development index. The Human Development Report (2005) did not support that the high growth in the last 40 years was due to the high human capital accumulation, and did not totally agree with cross the results of the country analysis that the human capital has a highly significant relation with growth.

Also, the contribution of human capital in the production is weak due to the low rate of return on the year of schooling in Syria which is equal to 2% according to Huitfledt and Kabbani, 2005. Moreover, the rigidities in the labor market prevent the smooth transfer of human capital to the real production. Finally, the weak education system plays an important role in the weak contribution of human capital (El-Erian et al 1998).

However, the life expectancy at birth is quite high, which might reflect the impact of human capital level on economic growth on the long run.

Institutions:

The contradiction with Barro-type is in the institutions results. The second section results confirm the importance of institutions. However, by analyzing the indicators of good governance published by the World Bank, it is clear that the quality of the institutions in Syria is poor (see Figure 6). The results are more obvious if associated with the ranking of Syria in comparison to the other countries. For example Syria's rank in voice and accountability is 196 of 208, in political stability is 169 of 213 , in government effectiveness is 191 of 210, in regulatory quality is 181 of 203, in rule of law is 119 of 208, and in control of corruption is 127 of 204.

These indicators bare many contradictions within themselves. For instance very low voice and accountability level and a high level of rule of law arouse some suspicions about the validity of data.

On the other hand, these indicators, according to the results of the cross country model, lead to the conclusion that the growth in Syria is weak and not sustainable. What is more, the investment climate is not conductive for private investment. Thus the institutions' quality in Syria does not support the sustained growth.

This case is not unique; there are many incidences of countries that have high growth with weak institutions like South Korea, China, Vietnam and Indonesia. After stages of high economic growth, the institutions themselves were improved. Thus it seems that the origin of growth in Syria is human capital and the causality runs from human capital to institutions which is in line with (Glaeser et al, 2004).

Military and Government Consumption:

The Middle East may be the hottest area in world in terms of conflicts, which leads to it being one of the largest importers of army equipment and weapons. These conflicts affect the priorities of the countries and the security takes precedence over economic or welfare issues. As a sequence, the efficiency of allocating resources is affected. Finally, the military imports makes for approximately 30% of total the imports and **11** % of the GDP during 1974-2000 (Roodman, 2004).

Openness:

According to the results of the cross country model, the openness has positive effect on growth but the SACW (Sacks and Warner 1995) indicator classified Syria as a closed economy. Thus, openness is not the factor that explains growth.

This again raises the question of causality between growth and openness in developing countries. Moreover, the dynamic productive sector is a prerequisite for the robust positive impact of openness on a country's efficiency and competitiveness.

To sum up, the Barro-type model could not inform us why Syria, the closed centrally planned country with large government and poor institutions, high population growth, moderate human capital, high public sector investment, has been growing for 40 years.

Moreover, the high population growth in Syria might have according to the endogenous theory positive effect through creating more "ideas". Finally, public and private investments are key factors in growth in Syria. On a last note, the life expectancy at birth seems to be a better proxy for human capital than the number of years at school.

In conclusion, the cross country models of the Barro-type cannot offer a solid explanation of the growth in Syria, which in turn creates a motive for studying the country's social condition to gain better insight.

4. Resume, Policy Implications and Conclusion

4-1 Summary of Results and Policy Implications:

First of all, the results and policy implications of section 3–1 Barro-type model have managed to answer the first question:

What are the main determinants of growth in developing countries?

- There is slow conditional convergence in developing countries, that the initial income has a negative relation with the growth rate.

- The initial human capital (life expectancy) is an important determinant of growth and has positive impact. Thus, the human capital has increasing returns, and the more the **country has a** high initial of human capital the more the probability of its growing faster. So, investment in health and human capital has an important impact on growth on the long run.
- School has **an insignificant positive impact**, which could be a result of the absence of quality of education in the indicator and/or a reflection of the rigidities of labor market institutions which need to be more flexible to translate the human capital to value added in the economy.
- The domestic investment is a core determinant of growth. This results are in line with all growth literature. However, the open question is the relative importance of capital versus the importance of total factor productivity in developing countries. So far, it seems that many developing countries start as factor driven economies, then, these countries shift to productivity driven economies.
- The institutions play a crucial role in economic growth. The better the quality of the institutions the better the economic environment, which increases the productivity of the economy.
- The government consumption demote economic growth in developing countries which have high corruption and low accountability in general.
- The inflation rate, as a proxy of macroeconomic policies, affects growth negatively. This result supports the importance of stabilization in the developing countries.
- Openness is important for growth since it is crucial to transfer technology from developed countries and open new markets. However, the causality is still an open question.
- The assassination as a proxy for the political instability impedes the growth rate, however the impact is insignificant. However, the representative ability of the indicator might be the cause.

Secondly, results and policy implications of section 3–2 (Growth accounting in Syria) have answered the second, third and fourth questions.

What are the sources of growth in Syria using growth accounting techniques?

- The economic growth in Syria was relatively high compared to developing countries for the period 1965-2004. However, the growth is highly volatile. Moreover, agriculture, trade, mining and manufacturing are the main sectors that contribute to economic growth, but the structure of production and exports are highly dependent on agriculture and mining sectors.
- The main sources of growth are physical capital, labor and human capital respectively. That means the factor accumulation was the major source of growth in Syria in the study period. The next step is to shift to a productivity driven economy.
- The Total Factor Productivity Growth (TFPG) contribution is 8% of total growth which is low and reflects the low technological progress in the economy.
- *What are the main determinants of Total Factor Productivity Growth in Syria?*
- The TFPG correlated strongly to growth in agriculture (climate fluctuating) and political instability (war, revolutions) and failed to reflect any technological progress; additionally it reflects the external and internal shocks. As a result, the development strategies should concentrate on technological change, innovation, and R and D to increase the productivity. Finally, improving institutions is crucial to absorb shocks and conduct productive activities.

To what extent does the Syrian economic growth analysis match the results of the cross countries empirics in Barro-type model?

- There are some results which are in line with the Barro-type results. The economic growth in Syria is associated with a relatively high domestic investment ratio; however 57% of it is public investment. It seems that the public investment has played a positive role in the economy but more in depth work is needed to analyze the structure of this investment, externalities and cost.
- On the other hand, there are many other factors which might contradict with the Barro-type model such as :
    - The quality of institutions is poor especially in terms of accountability and government efficiency, which cannot explain the economic growth but could explain the low productivity and high volatility.
    - The government consumption is relatively high especially in terms of the huge expenditure on the military expenditure, which needs to be rationalized.
    - The population growth is one of the highest rates in the world. However, according to the endogenous theory, there could be a chance to have more human capital resources on the condition of investing in the young population.
    - It is a closed country according to (Warner and Sacks 1995). However, the country has been opening gradually since 1990.
    - All of the above should predict low economic growth according to Barro-type model results.
    - It seems that the relative importance of factor accumulation, particularly physical investment and human capital, in Syria is much more than the cross section estimations.
    - The causality in Syria between human capital and institutions need more careful research.
- The main conclusion is that the new economic growth empirics could not fully explain the economic growth in Syria and there are some contradictions in some results.

4–2 Conclusion

The main results of the research are:

- The main determinants of growth in the developing countries are the initial income, initial human capital, the quality of institutions, domestic investment, openness, government consumption, political instability, and inflation.
- The main sources of growth in Syria are capital accumulation and labor growth, whereas the contribution of the total factor productivity is too low.
- Some results from the cross counties empirics are helpful in explaining the growth in Syria like domestic investment; however, many factors seem not to have their expected role in the relatively high growth rate in Syria which is associated with poor institutions, large size of government, closed economy and high population growth. Although, these factors are considered the main determinants of growth according to cross countries empirics, they contradict, to a certain extent, with the case of Syria which shows a sustained growth during the 40 years of the study period. On a last not, it seems that institutions follow growth in Syria's case.

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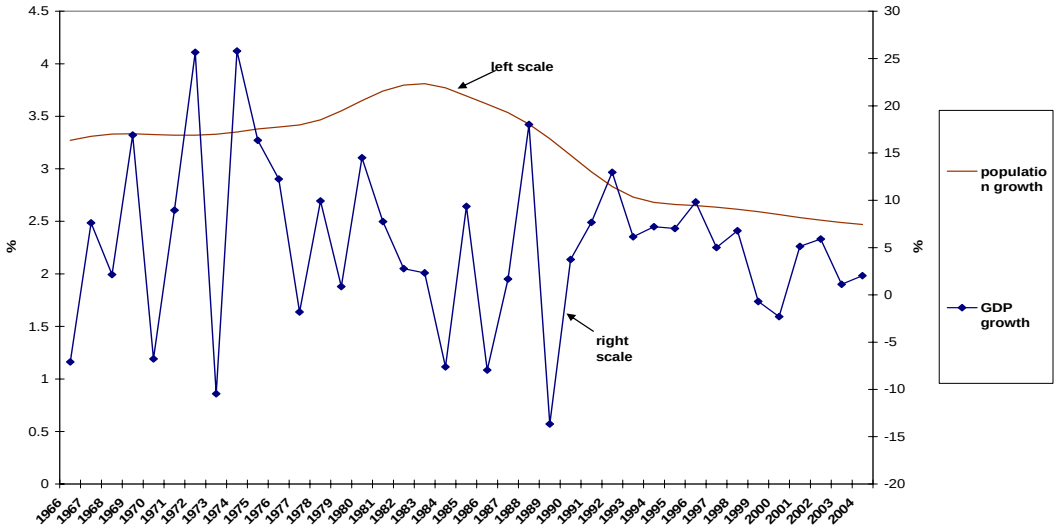
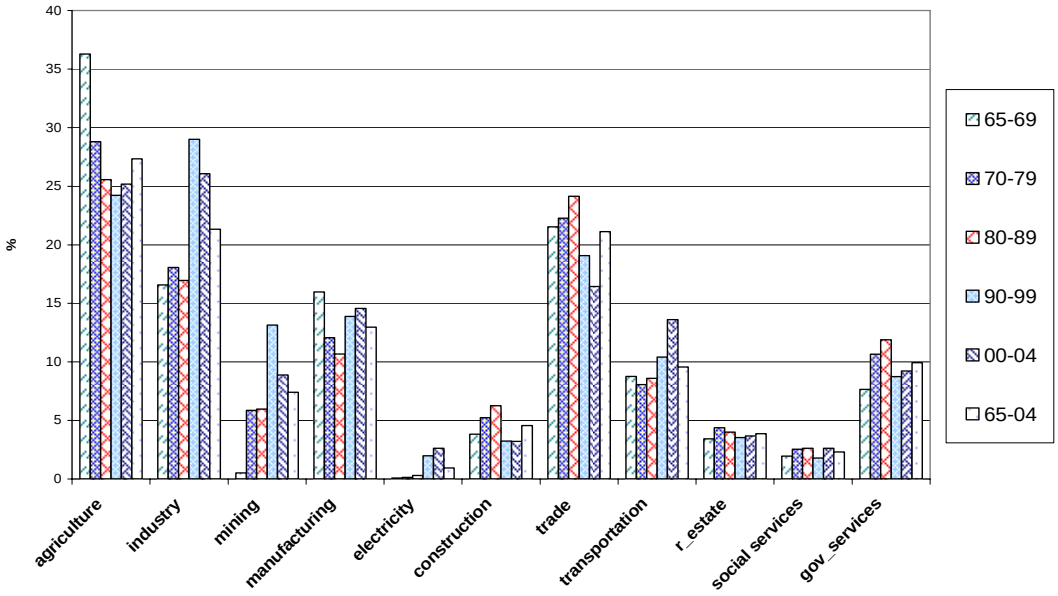
Figure 1: GDP Growth versus Population Growth in Syria 1966-2004:



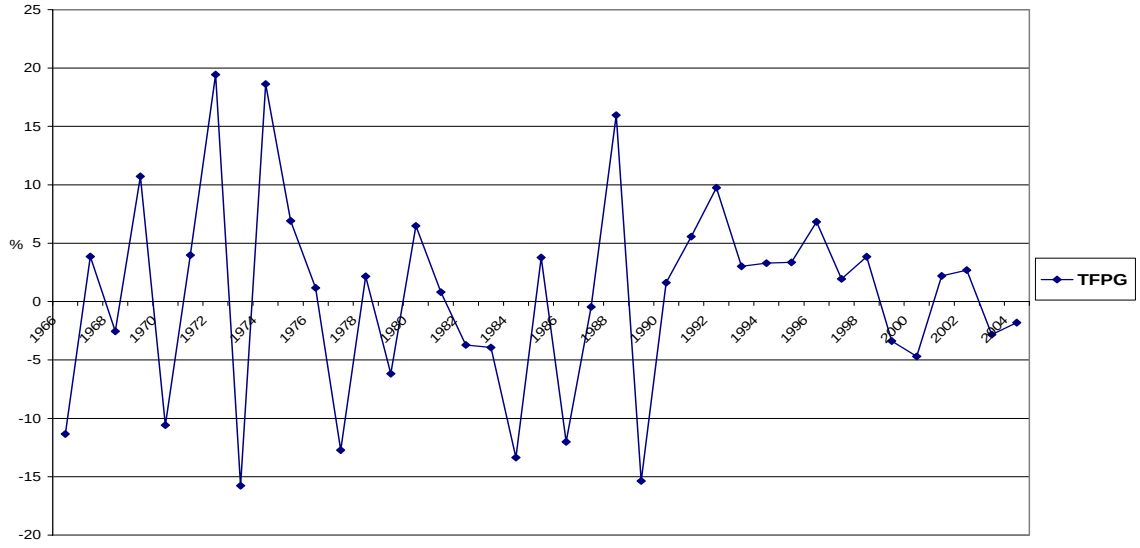
Source: World Development Indicators 2006

Figure 2: Structure of GDP for Different Sub-period during 1965-2004:



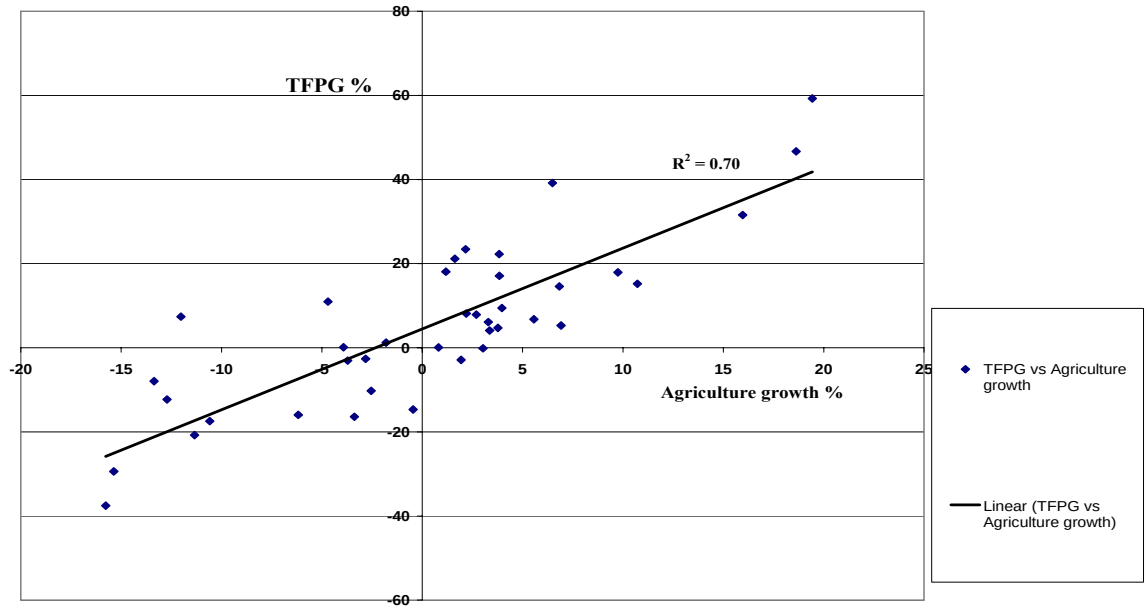
Source: Central Bureau of Statistics Annual Abstract Statistics

Figure 3: Total Factor Productivity Growth in Syria 1966-2004:



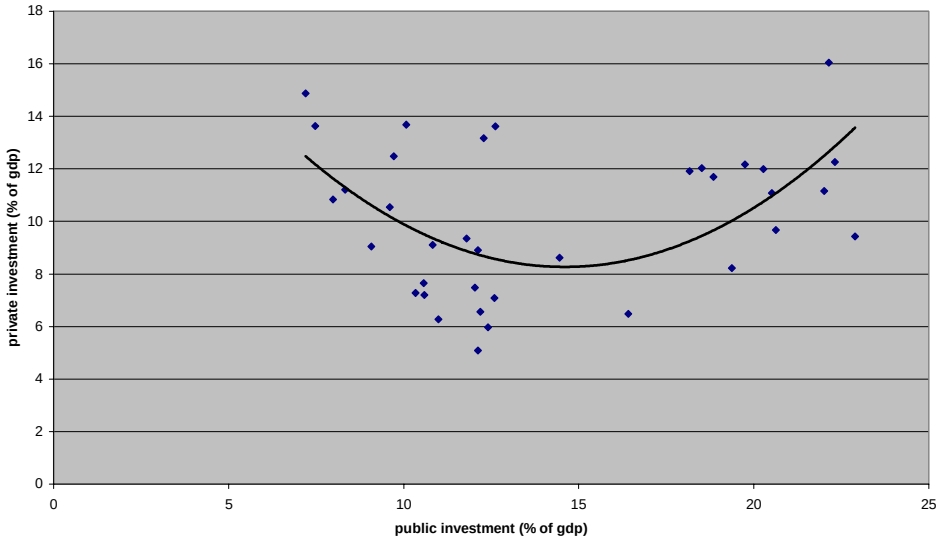
Source: Author's calculation

Figure 4: Linear Relationship between Agriculture Growth and Total Factor Productivity Growth 1966-2004



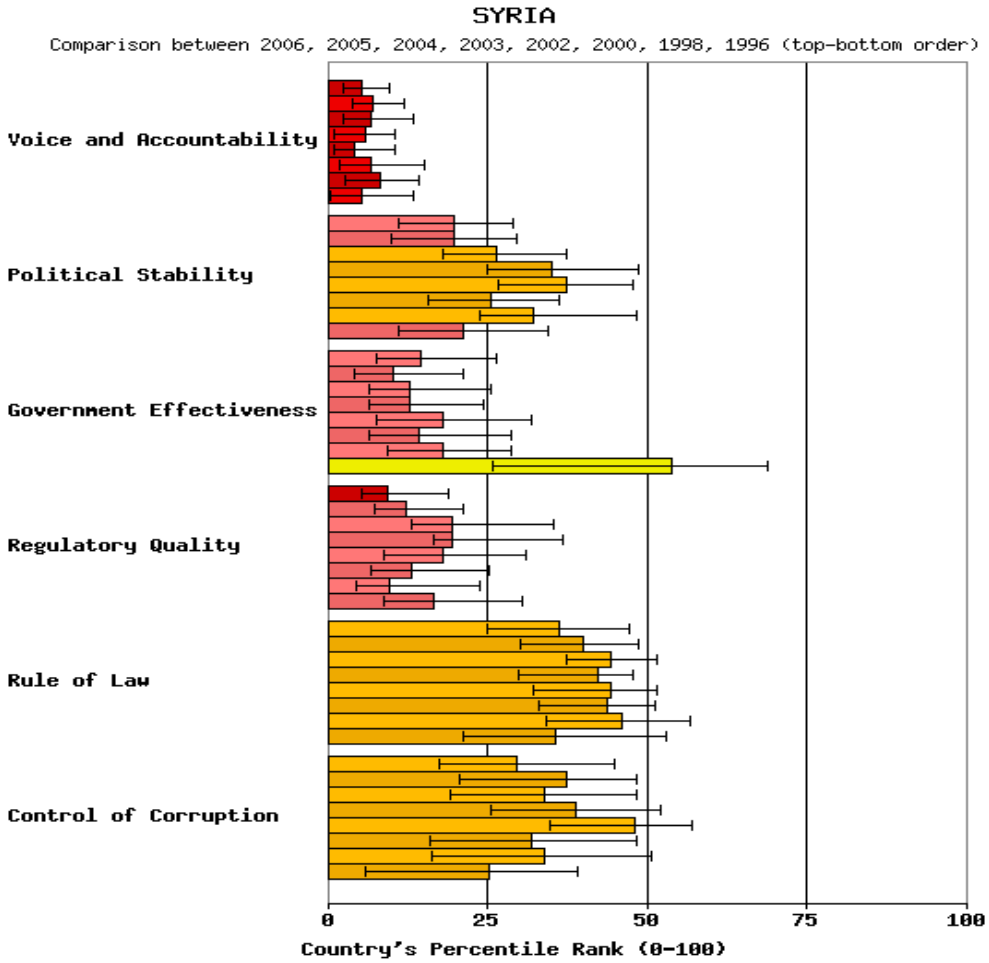
Source: Author's calculation

Figure 5: Public vs. Private Investment (% GDP) 1970-2005 at 2000 prices



Source: Central Bureau of Statistics in Syria – Annual Abstract Statistics

Figure 6: The Governance Indicators of Syria



Source: Kaufmann, Daniel, Aart Kraay and Massimo Mastruzzi (2007), "Governance Matters VI: **Aggregate and Individual Governance Indicators 1996–2006**," World Bank Policy Research Working Paper 4280, July.

Table 1: Three Methods to Test Growth Determinants BARRO-TYPE Model

Explanatory variable	LSDV Time dummies	LSDV Time and country dummies	2SLS Instrument variables
Log GDPPC(t-1)	-0.0452 ***	-.09042***	-.2672*
1/life expectancy at birth (t-1)	-15.0941 ***	-6.2016	-5.2461
Log(1+inflation)	-0.0765 ***	-.0618***	-.0481
SACW	0.0436 **	.0137	-.0246
GOVC	-0.4270 ***	-.6328***	-1.5575*
ASSAS	-0.0051	-	-
ICRGR	0.0160 ***	.0030	.0044
DGI	0.9825 ***	1.1301***	.5869
Constant	0.5260 ***	.7471***	2.1951*
R-squared	0.5761	0.7346	Wald chi2(57) = 241.90 Prob > chi2 = 0.0000
Number of observations	363	435	Instrumented: govc, gdi+

+ the instruments: Lnpop tot trade L3.lnrgdi L4.lnrgdi L5.lnrgdi L6.lnrgdi L2.lngdpp L3.lngdpp L4.lngdpp L5.lngdpp L6.lngdpp, and every exogenous variable is itself instrument
Notes: *** significant at 1%, ** significant at 5% , * significant at 1%

Table 2: LSDV Testing the Determinants of Economic Growth Barro-Type Model

Explanatory variable	Coefficient	t-statistic	Standard deviation of the explanatory variable	Note(1)
Log GDPPC(t-1)	-0.0452 ***	-3.42	1.2377	- 0.0559
1/life expectancy at birth (t-1)	-15.0941 ***	-4.13	0.0037	- 0.0553
Log(1+inflation)	-0.0765 ***	-4.11	0.2923	- 0.0224
SACW	0.0436 **	2.26	0.4080	0.0178
GOVC	-0.4270 ***	-2.32	0.0678	- 0.0289
ASSAS	-0.0051	-0.71	0.8082	- 0.0041
ICRGR	0.0160 ***	3.14	1.8539	0.0297
DGI	0.9825 ***	6.67	0.0714	0.0701
DUM3	-0.0436 **	-2.48		
DUM4	-0.1057 ***	-5.65		
DUM5	-0.1293 ***	-7.38		
DUM6	-0.1458 ***	-6.97		
DUM7	-0.1490 ***	-6.75		
DUM8	-0.1157 ***	-5.36		
Constant	0.5260 ***	4.00		
R-squared	0.5761			
Number of observations	363			
F(15, 59) = No cluster = 60	39.68	Prob > F = 0.0000		

Notes: *** significant at 1%
** significant at 5%
(1) Impact of increase one standard deviation in the independent variable on the growth

Table 3: Growth Sector Contribution in Syria 1965-2004

Period	1965-1969	1970-1979	1980-1989	1990-1999	2000-2004	1965-2004
GDP in 2000 prices	100	100	100	100	100	100
Agriculture	-7	21	19	25	51	21
Mining	13	10	27	12	-31	11
Manufacturing	18	4	31	23	-68	11
Electricity	0	0	3	3	6	2
Construction	10	9	-10	3	3	4
Trade	32	23	20	11	41	21
Transportation	6	7	15	13	40	12
Real Estate	4	6	-3	5	9	4
Social Services	6	4	-3	2	8	3
Government Services	18	16	2	3	42	12

Source: Central Bureau of Statistics in Syria – Annual Abstract Statistics

Table 4: Results of Determinants of TFPG Regression in Syria

Regression Statistics	
R ²	0.77
Observations	39

	Coefficients	***Robust Standard Error***	***t Stat***	***P-value***
Intercept	0.1312	0.8554	0.1533	0.877
Agriculture growth	0.3218	0.0388***	8.6366	0.000
Political instability	-5.4503	1.8502***	-3.2965	0.006

Notes: all variable are stationary using Augmented Dickey Fuller test
*** Significant at 1% level

Appendix 1: The Developing Countries in the Sample

	Country Name		*Country Name*
1	ALGERIA	44	LIBERIA
2	ARGENTINA	45	MADAGASCAR
3	BAHAMAS, THE	46	MALAWI
4	BANGLADESH	47	MALAYSIA
5	BARBADOS	48	MALI
6	BOLIVIA	49	MALTA
7	BOTSWANA	50	MAURITANIA
8	BRAZIL	51	MAURITIUS
9	BURKINA FASO	52	MEXICO
10	BURUNDI	53	MOROCCO
11	CAMEROON	54	MYANMAR
12	CENTRAL AFRICAN REPUBLIC	55	NEPAL
13	CHAD	56	NICARAGUA
14	CHILE	57	NIGER
15	CHINA	58	NIGERIA
16	COLOMBIA	59	PAKISTAN
17	CONGO	60	PANAMA
18	COSTA RICA	61	PAPUA NEW GUINEA
19	COTE D'IVOIRE	62	PARAGUAY
20	CYPRUS	63	PERU
21	DOMINICAN REPUBLIC	64	PHILIPPINES
22	ECUADOR	65	RWANDA
23	EGYPT	66	SENEGAL
24	EL SALVADOR	67	SIERRA LEONE
25	ETHIOPIA	68	SINGAPORE
26	GABON	69	SOMALIA
27	GAMBIA, THE	70	SOUTH AFRICA
28	GHANA	71	SRI LANKA
29	GUATEMALA	72	SUDAN
30	GUYANA	73	SWAZILAND
31	HAITI	74	SYRIAN ARAB REPUBLIC
32	HONDURAS	75	TANZANIA
33	HONG KONG	76	THAILAND
34	HUNGARY	77	TOGO
35	INDIA	78	TRINIDAD AND TOBAGO
36	INDONESIA	79	TUNISIA
37	IRAN, ISLAMIC REPUBLIC OF	80	TURKEY
38	ISRAEL	81	URUGUAY
39	JAMAICA	82	VENEZUELA
40	JORDAN	83	ZAIRE (D.R. CONGO)
41	KENYA	84	ZAMBIA
42	KOREA, REPUBLIC OF	85	ZIMBABWE
43	LESOTHO		

Appendix 2: Detailed Series Investment Categories in Syria 1965-2004

Year	*Investment in the 2000 Prices*	*Machines and Equipments*	*% of Total Investment*	*Non Residential Building*	*% of Total Investment*	*Residential Building*	*% of Total Investment*
1965	23548	9400	40	7975	34	6172	26
1966	28417	10879	38	9582	34	7956	28
1967	27421	13176	48	8360	30	5885	21
1968	33516	14589	44	10431	31	8496	25
1969	43534	19830	46	11148	26	12555	29
1970	32979	13486	41	10303	31	9191	28
1971	38472	13404	35	14673	38	10395	27
1972	48943	19332	39	17048	35	12564	26
1973	46222	20121	44	15724	34	10377	22
1974	63377	25136	40	23995	38	14248	22
1975	88846	45464	51	27668	31	15717	18
1976	116796	56647	49	40295	35	19855	17
1977	135464	72136	53	38038	28	25291	19
1978	117372	53814	46	35612	30	27946	24
1979	119271	38072	32	51287	43	29913	25
1980	145380	47904	33	54227	37	43251	30
1981	148331	46859	32	55713	38	45760	31
1982	152479	40758	27	66740	44	44982	30
1983	161397	52889	33	72210	45	36298	22
1984	163203	44309	27	78060	48	40834	25
1985	171136	41209	24	84217	49	45710	27
1986	151615	28261	19	76793	51	46561	31
1987	102138	33010	32	36321	36	32806	32
1988	98075	36877	38	41073	42	20125	21
1989	89161	39044	44	31465	35	18653	21
1990	99770	46832	47	30041	30	22898	23
1991	103442	45194	44	34012	33	24236	23
1992	137122	77241	56	34884	25	24997	18
1993	139083	71545	51	35577	26	31961	23
1994	167874	95906	57	39451	24	32517	19
1995	167846	94025	56	41166	25	32656	19
1996	167351	87750	52	48859	29	30743	18
1997	158944	78106	49	53613	34	27224	17
1998	164065	81640	50	56714	35	25711	16
1999	159793	82849	52	53758	34	23186	15
2000	156092	79326	51	59145	38	17621	11
2001	178148	103372	58	56202	32	18574	10
2002	196387	116247	59	62949	32	17305	9
2003	234818	139967	60	78457	33	16394	7
2004	239911	147687	62	65898	27	26326	11
average	65-04		44		34		22

Source: Central Bureau of Statistics in Syria Annual Abstract Statistics (different issues)

Appendix 3: Series of Capital Stock Workers, Human Capital and TFPG in Syria

Year	*Capital Stock (k) Millions**	*Growth of k %*	*Workers in Millions***	*Workers Growth %*	*Human Capital (Years)****	*Human Capital Growth %*	*TFPG % ®*
1965	250473	3.5	1.40271	2.0	1.34	6.2	
1966	263298	5.1	1.432461	2.1	1.34	4.5	-11.3
1967	274329	4.2	1.463099	2.1	1.34	4.5	3.8
1968	290768	6.0	1.494015	2.1	1.34	4.5	-2.5
1969	316202	8.7	1.528567	2.3	1.34	4.5	10.7
1970	329497	4.2	1.564012	2.3	1.67	4.5	-10.6
1971	347458	5.5	1.620296	3.6	1.67	5.4	4.0
1972	374772	7.9	1.677534	3.5	1.67	5.4	19.4
1973	397664	6.1	1.735632	3.5	1.67	5.4	-15.8
1974	436287	9.7	1.794931	3.4	1.67	5.4	18.6
1975	497974	14.1	1.854417	3.3	2.17	5.4	6.9
1976	583772	17.2	1.91291	3.2	2.17	5.7	1.2
1977	682896	17.0	1.971057	3.0	2.17	5.7	-12.7
1978	757758	11.0	2.030297	3.0	2.17	5.7	2.2
1979	829859	9.5	2.094458	3.2	2.17	5.7	-6.2
1980	923580	11.3	2.162979	3.3	2.86	5.7	6.5
1981	1014419	9.8	2.233245	3.2	2.86	4.4	0.8
1982	1103750	8.8	2.314988	3.7	2.86	4.4	-3.7
1983	1196439	8.4	2.395662	3.5	2.86	4.4	-3.9
1984	1285164	7.4	2.480469	3.5	2.86	4.4	-13.4
1985	1376298	7.1	2.56808	3.5	3.54	4.4	3.8
1986	1442239	4.8	2.628346	2.3	3.54	4.2	-12.0
1987	1454597	0.9	2.703217	2.8	3.54	4.2	-0.5
1988	1462123	0.5	2.789916	3.2	3.54	4.2	16.0
1989	1460267	-0.1	2.879852	3.2	3.54	4.2	-15.4
1990	1469136	0.6	2.974553	3.3	4.35	4.2	1.6
1991	1481125	0.8	3.073285	3.3	4.35	3.7	5.6
1992	1526047	3.0	3.17131	3.2	4.35	3.7	9.7
1993	1570134	2.9	3.269311	3.1	4.35	3.7	3.0
1994	1640267	4.5	3.367167	3.0	4.35	3.7	3.3
1995	1706007	4.0	3.465315	2.9	5.21	3.7	3.4
1996	1767159	3.6	3.561697	2.8	5.21	2.0	6.8
1997	1816097	2.8	3.7361	4.9	5.21	2.0	1.9
1998	1867110	2.8	3.894449	4.2	5.21	2.0	3.8
1999	1910676	2.3	4.057716	4.2	5.21	2.0	-3.4
2000	1947828	1.9	4.212927	3.8	5.74	2.0	-4.7
2001	2004724	2.9	4.381444	4.0	5.74	1.9	2.2
2002	2076317	3.6	4.547939	3.8	5.74	1.9	2.7
2003	2181884	5.1	4.707117	3.5	5.74	1.9	-2.8
2004	2285973	4.8	4.885987	3.8	5.74	1.9	-1.8
Average		5.9	2.7	3.2	3.4	4.1	0.4

* Estimating the capital stock according to Perpetual Inventory Method

** Source Penn World Table 6.1

*** Source: Barro, Lee (2000) data set

® TFPG has been calculated using growth accounting method with the assumption that the elasticity of physical capital, workers and human capital to GDP are 0.52, 0.24 and 0.24 respectively.