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) matching the results of growth accounting exercise in individual country, SYRIA in this case, during the period 1965-2004. To deal with this matter three main steps have been followed: Firstly, using cross-country growth empirics to find out the determinants of the economic growth in the developing countries. Secondly, the individual country growth accounting has been used to examine the sources of growth in Syria. Lastly, testing the extent to what, the results of cross-country model match the individual country analysis of Syria. The main results of this paper are:

- The main determinants of growth in the developing countries are domestic investment, initial income, initial human capital, quality of institutions, government consumption, inflation, openness, and political instability, respectively.
- The main sources 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 like domestic investment; however, some other factors seem not to have the expected role, For instance, the relative high growth rate in Syria has associated with poor institutions, large size of government, and closed economy, which considered as main determinants of growth rate according to cross-country Empirics. Therefore, the cross-country growth empirics could contradict, to a certain extent, with the results of country specific growth accounting (in Syria case).

هل تشرح تطبيقات نماذج النمو الحديثة عبر الدول تجربة النمو لدولة منفردة (حالة سوريا 1965–2004) ؟

ملخص

تهدف هذه الورقة إلى اختبار ما إذا كانت نتائج نموذج "بارو" لتحديد مصادر النمو الاقتصادي عبر البلدان، متطابقة مع نتائج دراسة محاسبة مصادر النمو في اقتصاد محدد،والمثال المعتمد هو سوريا للفترة 1960–2004. للتعامل مع هذه المسألة تم اتباع ثلاث خطوات : بداية تم استخدام نموذج "بارو" لدراسة مصادر النمو الاقتصادي في 85 بلداً نامياً، ثم تم استخدام محاسبة النمو الاقتصادي لتحديد مصادر النمو الاقتصادي في حالة سوريا على الأجل الطويل، وأخيرا تم اختبار درجة تطابق نتائج المنهجين. وأهم نتائج البحث:

- بتطبيق نموذج بارو للنمو الاقتصادي عبر الدول و باستخدام بيانات 85 دولة نامية كانت أهم محددات النمو الاقتصادي حسب أهميتها النسبية هي:الاستثمار المحلي ، الشروط الابتدائية (الدخل الابتدائي و رأس المال البشري الابتدائي)، المؤسسات، التضخم، الاستهلاك الحكومي ثم الانفتاح و أخيرا عدم الاستقرار السياسي.
- إن أهم مصادر النمو الاقتصادي في سوريا هي تراكم راس المال، رأس المال البشري، والعمالة على التوالي، بينما تعد مساهمة مجمل إنتاجية عوامل الإنتاج ضعيفة للغاية.
- بعض نتائج نموذج "بارو" للنمو عبر البلدان متقاربة مع دراسة الحالة في سوريا– التي حققت نموا مرتفعا نسبيا مقارنة بالدول النامية المشمولة بالدراسة– مثل أهمية الاستثمار المحلي. ولكن هناك نتائج متناقضة إلى حد ما، مثل ضعف المؤسسات وارتفاع الاستهلاك الحكومي والاقتصاد "المغلق" في سوريا، التي من المفترض أن تقود إلى معدل نمو منخفض حسب نموذج "بارو".

1. Introduction

1.1 Preface

Economic growth is a core target of every country, because it is a necessary, but not sufficient condition to improve welfare of people. What is more, to achieve the goal of triggering and sustaining economic growth rates, sources of economic growth have to be examined. Hence, huge economic literature have been allocated to economic growth field, theoretically and empirically.

One fact about the history of economic growth is the difference in the economic growth rates between countries, which is one part of the lively research area of growth. 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 economic growth theory and new empirics could not explain fully either the miracles in economic growth such as the South East Asia countries and Botswana or the disasters such as Sub-Sahara Africa countries. As a result, the research on the country level has been developing recently to understand the special case of each country. Also, the country level research has given a feed back to cross countries growth empirics to take more factors into consideration in the economic growth regressions.

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

1.2 Aims and Objectives

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

The cross-country new growth empirics are widely used in explaining the economic growth in developing countries, for many reasons like: trying to generalize the theory of economic growth on the developing countries, and the powerful of panel data methods that solve many econometric problems. As a result, many economists build their economic growth researches on the cross-country empirics, in stead of country case studies. Therefore, this paper raises the question of appropriateness of using the "popular" cross-country results for specific country growth case. In addition, the case of Syria is interesting in terms of 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 using growth accounting

techniques?

3. What are the main determinants of Total Factor Productivity Growth in Syria?
4. To what extent the Syrian economic growth analysis match the results of the cross countries empirics in questions 1 above?

1.3 Methodology:

A quantitative approach has been used through this research with different methods in each of the different models in chapter two as follows: In the section 3-1: the Cross Countries Difference Growth Model due to Barro and Sala-I-Martin (2004) (Barro-Type, henceforth) which aims to define the determinants of the economic growth, has been used. This type of model is a useful tool to understand the difference in the economic growth rates between the developing countries. The advantage of this model is the flexible framework that gives the researchers the opportunity to test the relationship between different factors and growth rates.

The econometric problem of the cross-country regressions is heterogeneity, endogeniety, measurement error and regional spillover. However, the panel data give the best solutions to the problems of omitted variables which are constant over time like initial level of technology. Also, there is an ability to use lags as instrumental variables to deal with endogeniety and measurement error biases (Temple, 1999). Furthermore, no endogeniety problem has been found in the model which let the OLS method the best least unbiased estimator.

Section 3-2: will present the Syrian economic growth analysis using different methods: Firstly, descriptive analysis has been implemented to analyze for the trend of growth and the structure of the Syrian economy, besides, the contribution of sectors in the economic growth. Secondly, we have applied 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 used widely in estimating the capital stock in the economic growth literature.
- Estimating the depreciating 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 has been estimated through calculating the average share of wages of income with the assumption that this elasticity is fixed. This elasticity disaggregated to two parts: the first one is the share of minimum wages in the total income which is the elasticity of labor. The second one is the difference between the average wages and the minimum wages which reflect the price of human capital (the education and experience) (Rodrik, 2003).

- The elasticity of the physical capital is the residual of one minus the sum of the elasticities of labor and human capital since we have used 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 and labor and human capital.

To analysis the TFPG, an ad hoc regression has been implemented using the growth rate of agriculture and dummy for the political instability as 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, which is the main question of the research; we compare the results of the cross-country models with the results of the Syrian economy analysis during the 1965-2004.

1.4 The 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 has been built for this research from the World Developing Indicators 2006 (World Bank CD 2006). There are 85 developing countries which have been chosen depending on three criteria: developing, availability of data (so most of the Soviet Union and the Eastern Europe has been 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 which have been used: GDP per capita (constant 2000 US$), population growth (annual), and Gross Domestic investment (% of GDP) taken from the World Development Indicators 2006. Also the average school for the population over age fifteen years as a proxy for the human capital level, the source of schooling is Barro and Lee (2000).

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

Data for the Syrian economy analysis:

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

2. Literature Review

2.1 New Growth Empirics

The economic growth empirics have been flourishing since the influential work of Barro (1991).Moreover, the weak link between the growth theory and the real world results have stimulated an ad hoc empirical work to understand the determinant of growth especially, after the failure of the growth theory in prediction and analysis, the growth miracle in the south East Asia or even in Botswana.

Three growth empirics' areas have attempted to understand the growth mechanism: the difference in income levels between countries (which is beyond the scope of this research), the difference between growth rates in the developing countries, and the single country growth analysis.

2.1.1 The Difference in Cross-Country Growth: New Growth Empirics

The insufficient answers for the main growth questions let the empirical and theory evolve together. The empirical economists attempt to find the determinants of the growth, also, to explain the reasons of the variation of 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 and population, and religion on growth (Barro, Sala-I-Martin, 2004).

The initial conditions: the initial human capital and income:

Life expectancy and education, as a proxy of the human capital, have an important effect on growth (Barro, Sala-I-martin, 2005). Thus 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 negative relation with the growth if the other growth determinants have been controlled. This result supports the conditional convergence.

Social infrastructure (institutions and government polices):

Social infrastructure is the institutions and the government polices, which control the economic climate that the people work, invest and initiate in. According to Jones, (1999) the social infrastructure affects the level of income and help to understand the difference of the productivity of worker, 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 the state for the institutions that govern economic and social interactions among them". Nevertheless, regarding practical availability of indicators to measure institutions quality, recent literature have been using governance indicators of (Kaufmann et al 2007) or ICRG indicators. However, these indicators are subjective measurements of institutions, which might not measure the quality of institutions 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 studies about institutions suggest the positive impact of good institutions on the productivity, hence, on the growth rate (Rodrik, 1994, Barro, Sala-I-martin, 2004). Moreover, institutions have an important role in triggering the growth and sustaining it. Also the institutions should adapt with the country specific to find creative solutions, which will be relative to an individual country (Rodrik, 2003).

On the other hand, Knack and Keefer (1995) provide an important indicator of the institutions` quality which consists of equal weight of five elements: law and order, bureaucratic quality, corruption, risk of expropriation and government repudiation of contracts. This indicator has been widely used in growth empirics (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. On the contrary, some claim that the good institutions are the result of growth and human capital level (Glaeser et al, 2004).

Moreover, the difference in growth rates of the 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 the growth (Temple, 1999) and this expenditure has a crowding-in effect on the private

investment. Besides, the public invest in human capital such as health and education increases the productivity of the private investment (Agénor, 2004). Furthermore, the role of macroeconomic polices in achieving stabilization is important for the economic growth. The high inflation, for instance, has a negative impact on the productivity and the stock of capital.

Physical capital:

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

Size of the 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 the inefficient governments and the corruption.

Openness:

According to the endogenous theory the openness is important for growth since it helps in importing the technology which leads to higher economic growth. Moreover, the openness creates larger markets especially for the small developing countries. (Sacks and Warner, 1995) have built index for the openness depending on the ratio of customs, non-tariff barriers, the government 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 specialists in manufacturing exports the more benefit of the openness (Temple, 1999). In general, the openness in the developing countries leads to limited benefits due to the low technology and low comparative advantages and the depending on raw material of the exports (Agénor, 2004).

2.1.2 Growth accounting: Country Growth Empirics

The studying for the individual country helps to understand the main determinants in the growth on the long and short run, also the reason for the miracles and disasters growth in many economies.

The main approach is the growth accounting following Solow 1957; this approach has many shortages such as the difficulty of choosing the right production function and the weak data about the capital stock, the structure of the workers and the wages. Furthermore, the assumption of the constant-elasticity-of-substitution (CES, henceforth) production function has many shortages. Although , 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 for the precise estimation of the elasticity of the capital and labor.

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

Total Factor productivity:

There are many researchers on the total factor productivity (TFP) in the developing countries started with Solow in study about TFP in the united state. Also the results show that more than 50% of the economic growth in USA during 1900-1950 is TFPG which represents the technological progress. Conversely, many recent studies in the developing countries have concluded that the TFPG is not the major contributor in the growth. Further, the 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, other researchers argue that these results are not precise such as, (Klenow and Rodriguez-Clare, 1997), and (Easterly and Levine, 2000). They emphasize the importance of the technology in the growth on the long run. The main reason for different results is the different estimation of the elasticity of capital. Moreover, there is trend to underestimate the contribution of physical capital in output in the developing countries.

On the region level, the important work of (Makdisi et al 2003) in growth accounting emphasis the low contribution of the TFP in growth in MENA region. However, Syria was not in the sample. On the other hand, they estimate the capital elasticity through regress 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 of 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 the growth across the countries. This process could clarify the unexplained part of the growth process in the developing countries.
The theory framework of Barro-type model is still ambiguous. The contribution of the main production factors the initial physical capital and the initial human capital has been used. However, the other variables which control of 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 given the governmental policies important role (Temple, 1999). Furthermore, some concentrate on the role of the R&D and ideas (like Aghion and Howitt, 1998) some concentrate on the institutions (Rodrik, 1994, 2003) (Hausmann et al 2005) (Acemoglu et al, 2002) political instability (Sacks and Warner, 1997) and the culture and ethnics (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 frame work 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 explain below Barro Sala-I-Martin, 2004 and Easterly have been followed in the definitions of the variables. Also, the model which has been chosen set the most important variables which may explain the growth:

3.1.2.1 The Variables

The initial conditions:

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

Also, another measure of the human capital, to measure the impact of human capital on growth, has been used but not as initial condition, which is the average years of school for the population over age 15 years (**SCHOOL**) (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).
- The government consumption: The main argument against the 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 give chance to import the technology which affects the growth positively, they see that the causality is not obvious though. The measure has been used is the SCAW (Sacks and Warner, 1995)
- Investment: the investment affects the growth positively. The measure has been used (GDI) is the investment as percentage of GDP
- Inflation: the macroeconomic policy affects the economic growth through many channels, mainly stabilization. Inflation is one important indicator of the stabilization which affects the growth negatively. The measure has been used INFL= log (1+inflation) following (Easterly et al, 2000).
- Political instability: the political instability affects the growth negatively the proxy which has been used is the assassination measure (ASSAS) (Easterly et al, 2000).

3.1.2.2 Robustness

Testing for endogeniety:

With suspect of the endogeniety especially for the ratio of investment to the GDP and the government consumption, testing for the endogeniety has been tried 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 the life expectancy and the other expletory variables in the regression as its self instruments like the institutions variable, the assassination, and initial income.

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 endogeniety. Moreover, using OLS robust for the heteroscedasticity and using clusters to avoid auto correlation.

*3.1.3*The Regression Results: table 1

The initial conditions:

- the initial income: The relation is significant and the sign refers to existence of the conditional convergence in the 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.

Table 1: 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

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 characterised 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 analyse 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.*

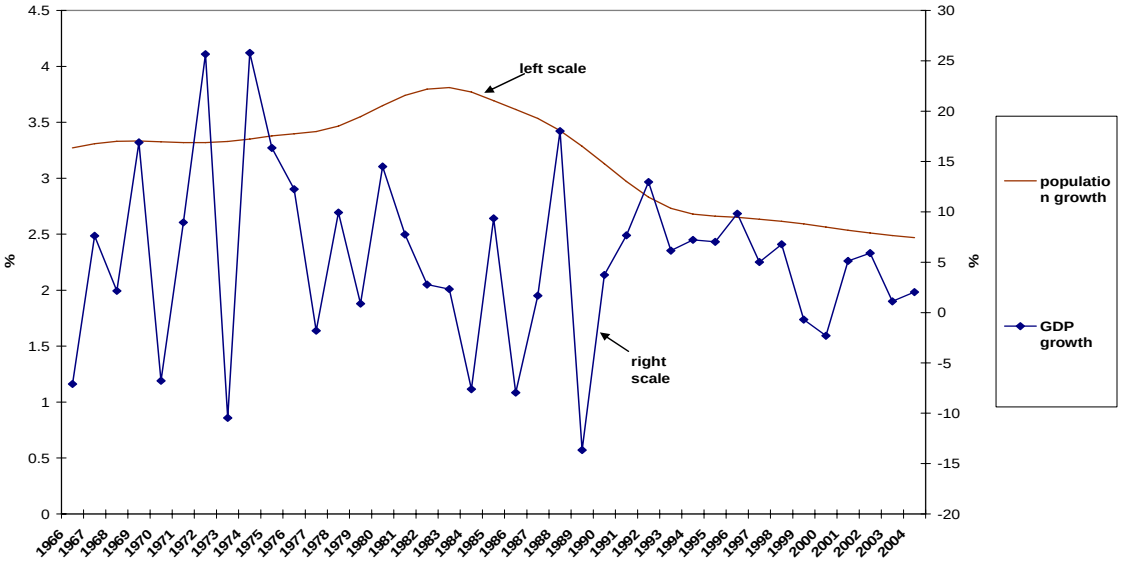
The first step in the analysis is to implement the growth accounting technique to figure out the main resources of growth in the period 1965-2004, mainly, the analysis of the contribution of the accumulation of the production factors versus the total factor productivity. After that, it will be testing 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.

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



Source: World Development Indicators 2006.

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.

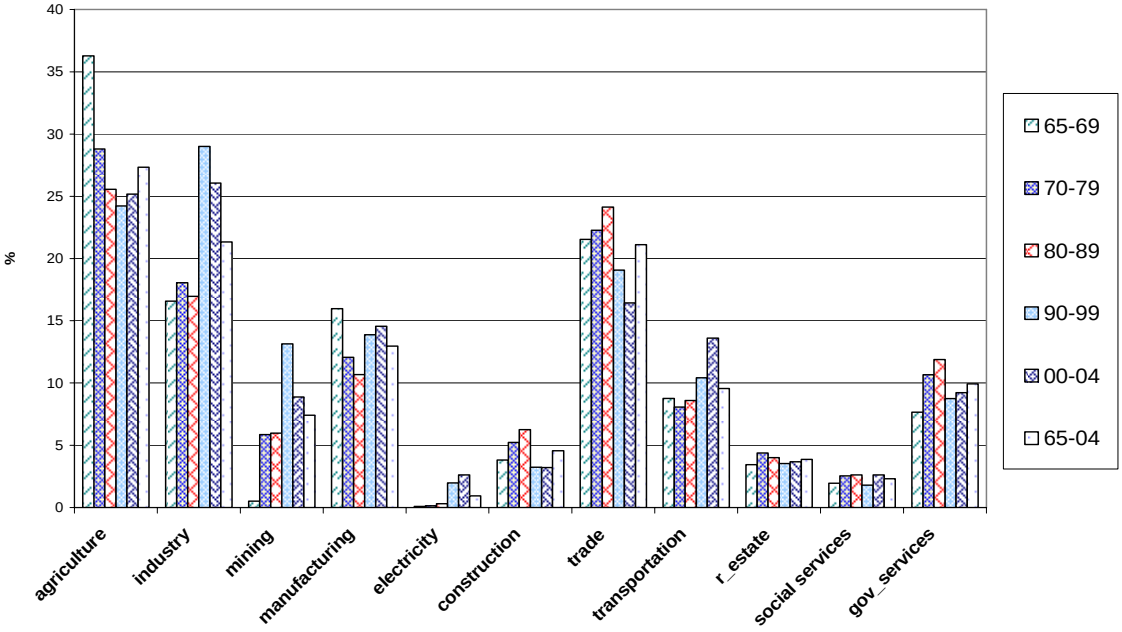
Furthermore, the relative high growth in Syria has not depended on the growth of one or two sectors, on contrary it could be seen from the table that the growth rate of the non-oil GDP is 5.13% and for the non-oil and non-agricultural GDP is 5.59%. Thus, the growth in Syria is not just results of abundant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

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



Source: Central Bureau of Statistics Annual Abstract Statistics.

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 contributions of the sector in the growth rate gives another evidence of the diversification of the Syrian economy that on average: agriculture has contributed by 21% and the trade by 21% and each of transportation, government services by 12 % and each of mining and manufacturing by 11%, in the growth(table 2), Which is healthy evidence, on one hand. However, the growth depends heavily on the low productive sectors like agriculture and mining and trade and government services which might explain part of the fluctuation of growth in Syria.

Table 2: 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.

For dealing in depth in the productivity, we have to look for the factors which affect the TFPG. So, the next question to answer is what the determinants of the productivity growth in Syria are.

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 (Young, 1995). However, the main restrictions for the translog are the need to estimate the elasticity of capital and labour and the human capital in precise way which is a difficult target to achieve in the developing countries and the other restriction is the collinearity in the model (Agénor, 2004).

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

It will be 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, where Y_t is the output, and K_t the capital, A_t L_t level of technology for one labor which called effective labor .Also, α is the elasticity of capital toward output. And β is the elasticity of human capital towards output.

To build the time series of the variables and to estimate the parameters, specific methods and assumptions have been used for each of them. As follows:

3.2.6.2 Capital stock

The Perpetual Inventory Method to estimate the capital stock has been used in the following steps 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 : capital stock in year t, δ is the annual depreciation rate of capital .and I_i is the investment in year i.
Firstly, the *time series of the investment* in the fixed price using the national data has been build. Secondly, the *initial capital* (K_{1965}**)** has been 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 the disaggregating of the investment in the period 1965-2004: with the estimation that the life of the residential capital is 50 years and for non residential 40 years and for equipment and machines 15 years (Hofman, 2000). Then the weighted depreciating rate has been calculated 6.2% which is in line with results which estimate the depreciation between 4 and 6 % in developing countries.
As a result, by substituting the investments series and the initial capital and the depreciating rate in the formula (1), the capital stock series has been estimated (Appendix, 2).

3.2.6.3 Labour and Human capital

The series of labour has been taken from PENN world Table 6.1 since the national statistics about labour is not consistent and the population series is not the right represent of the labour due to the demographic changes and the unemployment. Furthermore, the average years school of population over age 15 years taken from (Barro, Lee, 2000).

3.2.6.4 Elasticises

With the assumptions of the perfect competition and the contribution of each of the production factor equal its share in the income, the elasticity of the labour has been estimated. Moreover, the wage share of income has been calculated during the period 1992-2002. Using the assumption that the share of wages is fixed, the results generalized to the whole period. Thus, the average share of labour is 48% of income. Moreover, the elasticity of the human capital is the part of labour contribution that

stemming from the education and experience of the 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 the work of labour without education or experience. Furthermore, the minimum wages in average 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 the physical capital is one minus the contributions of the labour and human capital that is 52% of the national income, under the assumption of the constant rate of returns for all factors.

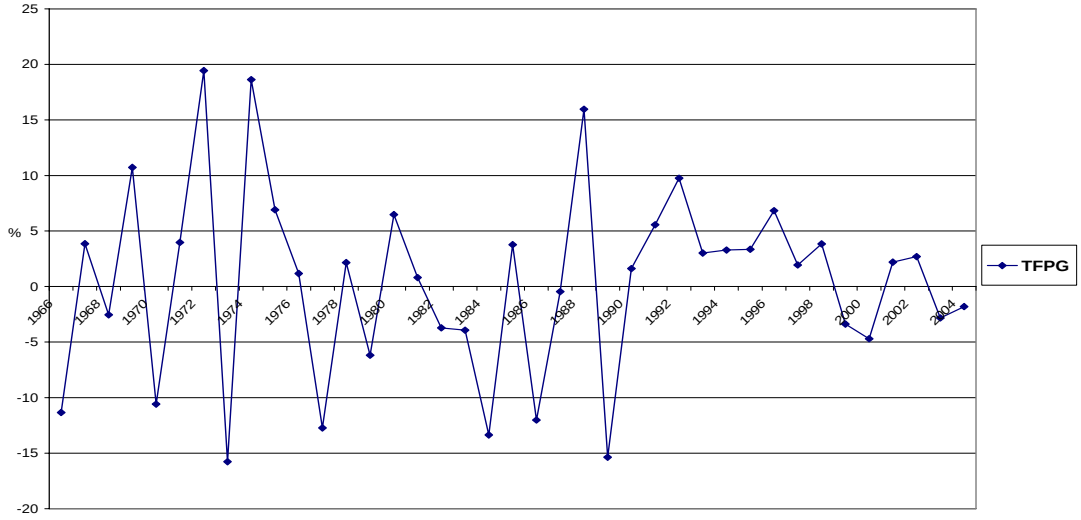
3.2.6.4 Total Factor Productivity Growth (TFPG)

These results in line with estimation of the capital elasticity of physical capital for the developing countries in the first section of this paper, one reason for this might be the too 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.
The growth of capital series and the labour and the human capital have been used to calculate the total factor productivity growth through the formula: (see appendix 3)

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

Where TFPG if the growth of total factor productivity, gK is the growth of the stock of physical capital, gL is the growth labour, gY is the GDP growth and gH is the human capital growth. Besides, α, β, and (1- α-β) is the elasticity of the capital human capital and labour respectively.

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



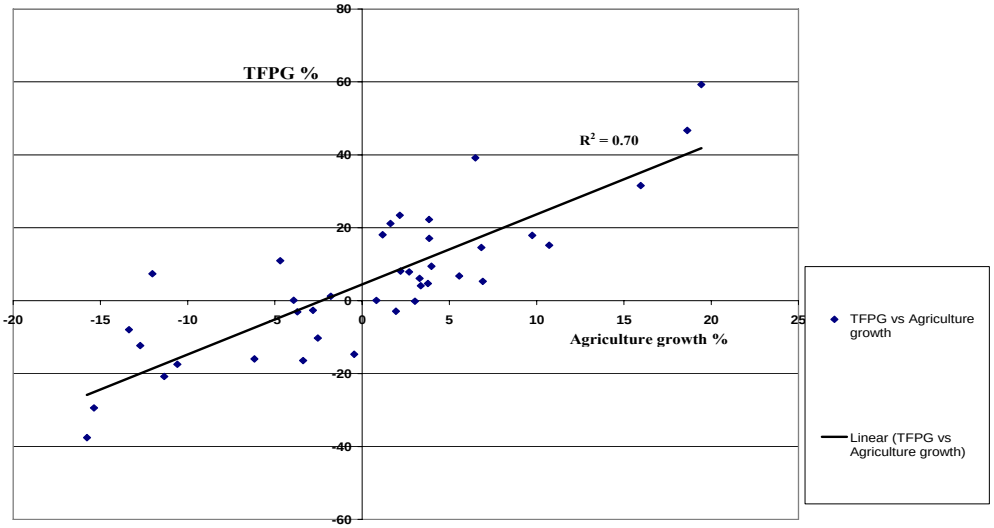
Source: Author` Calculation.

The results that the TFPG is interesting that the average growth of TFPG during the period 1965-2004 equal 0.44% which is just 8% of the total growth rate of GDP for the same period. These results support the point of view which considers the factors` accumulation is the main sources of growth in the developing countries.

Moreover, figure (3) shows the highly volatility of the TFPG, around average close to zero, which might not reflect the growth of technology the ultimate source of growth. According to these results many questions have been raised about the validity of the economic growth theory and the cross countries results which have been presented in section one and two.

The first question is; why does TFPG fluctuate so much?
Using simple ad hoc regression, it has been created for the aim of this regression a dummy which represents the political instability between 0 and 1. Giving 1 for the war or external economic restrictions and internal revolution or huge violence, zero otherwise. It has been found that there were two wars 1967 and 1973. Political main changes were in years 1966, 1970, 2000. Internal violence happened during 1982-1984 . Also the western international restrictions happened in 1986.

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



Source: Author calculation.

The other variable is the growth rate of agriculture which has been highly fluctuated due to the dependency on the rain, 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 in table (3) that the correlation is strong and it explains 77% of the TFPG. The agriculture growth has a positive sign and is significant whereas the political instability is negative and significant. Thus, the TFPG has been affected by shocks not by technological progress.

Table 3: 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

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 has shown that Syria has not experienced a 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 the other hand, the negative impact of political instability could be explained by the weak institutions which reduce the ability of the economy to persist the shocks. Thus, the weak institutions could explain the highly volatility of growth in the Syrian economy.

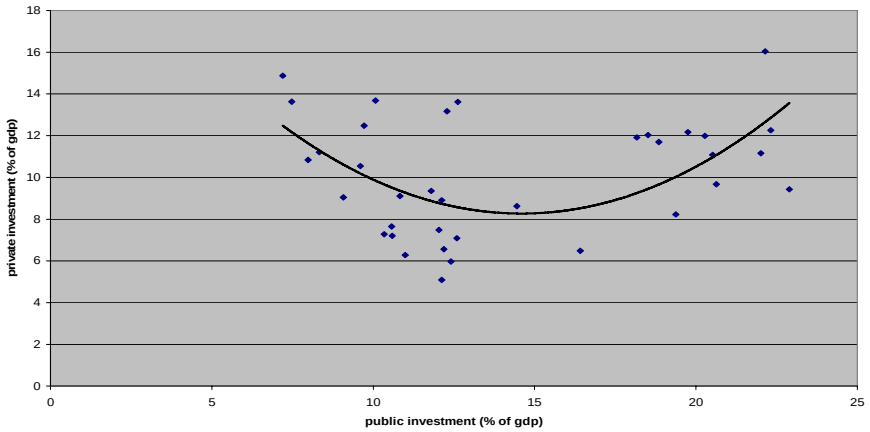
3.2.7 Testing for Validity of Barro-Type Model in explaining Syrian Growth

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

Investment:

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

Figure 5: public vs. private investment (% GDP) 1970-2005 at 2000 prices



Source: Central Bureau of Statistics in Syria Annual Abstract Statistics

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

Human capital:

Although there is dramatic improvement in the human capital in Syria since 1965, Syria ranked 111 out of the 173 in human development index, According to the Human Development Report (2005), which again do not support that the high growth in the last 40 years due to the high human capital accumulation, and do not agree totally with cross country analysis that the human capital have 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 school in Syria which is equal according to (Huuitfeldt and Kabbani, 2005) 2%. Moreover, the rigidities in the labour market prevent the smooth transferring of the human capital to the real production .also the weak education system play 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 the economic growth on the long run.

Institutions

The contradiction with Barro-type is in the institutions results. The second section results assure the importance of the institutions. However, by analysing the indicators of the good governance published by world bank as it could be shown in

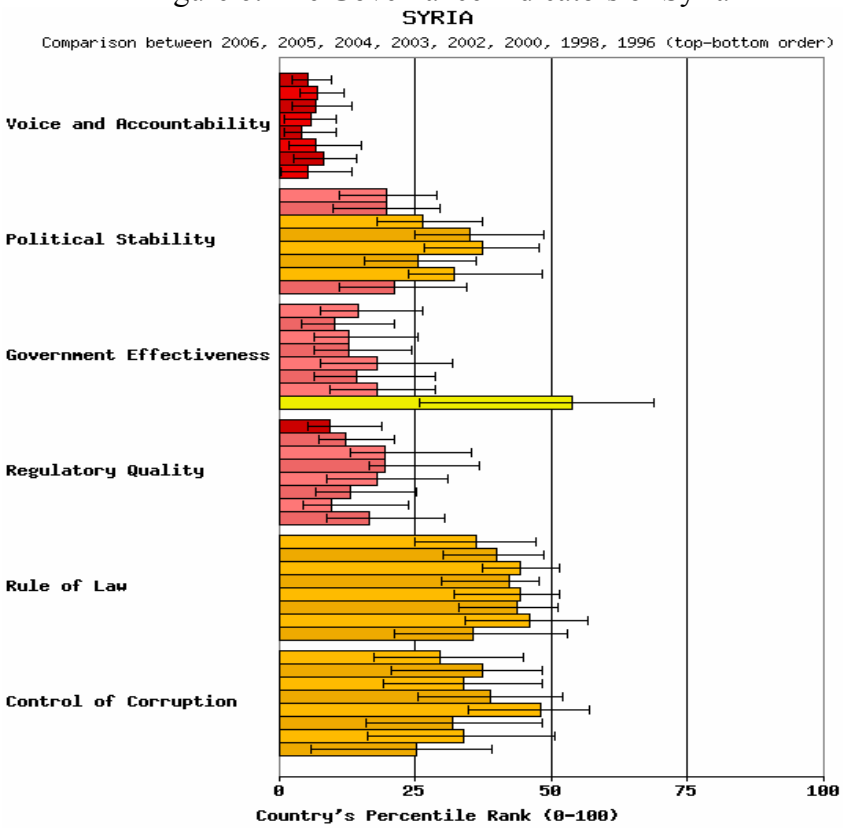
figure (6) that the quality of the institutions in Syria is very poor the results might more obvious if it associates with the ranking of Syria in the other countries for example Syrian rank in voice and accountability is 196 out of 208, Political stability is 169 out 213 ,Government effectiveness 191 out 210, Regulatory quality 181 out 203, Rule of law 119 out 208, and Control of corruption 127 out 204.

These indicators are carrying many contradictions itself, for instance very low voice and accountabilities level and high level of rule of law relatively lunches some suspicious 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 sustained. 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 experience who have high growth with weak institutions South Korea, China, Vietnam, and Indonesia. After stages of high economic growth the institutions have been improved. Thus it seems that the origin source of growth in Syria is human capital and the causality from human capital to institutions this results in line with (Glaeser et al, 2004).

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

Military and government consumption:

Military imports: the Middle East might be the hottest area in world in terms of conflicts, which leads it to be one of the largest importers of army equipments and weapons. These conflicts affect the priorities of the countries and the security jump above the economic or welfare issues .As a sequence; this will affect the efficiency of using the resources efficiently. Finally, the military imports value about 30% of 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 the growth but the SACW (Sacks and Warner 1995) indicator classified Syria as closed country. Thus, openness is not the factor that explains growth.

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

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

Moreover, the high population growth in Syria might have according to the endogenous theory positive effect through creating more "ideas". Finally, the public and private investment is a key factor in growth in Syria. Finally, the life expectancy at birth seems to be better proxy for human capital than numbers of years at school.

As a result, the cross country models the Barro-type could not give a solid explanation of the growth in Syria which creates the motivation of studying the individual countries to understand the country economic social conditions.

4. Resume, Policy Implications, and Conclusion

4.1 Summary of Results and Policy Implications

First of all, results and policy implications of section 1 Barro-Type model have answered the first question:

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

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

- The initial human capital (life expectancy) is important determinant of growth and has positive impact. Thus, the human capital has increasing returns, and the more the country has high initial human capital the more the probability of growing faster. So, investment in health and human capital has important role on growth on the long run.
- School has an insignificant positive impact, which could be a result of the absence of the quality of education in the indicator and/or due to 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 in line with all the growth literature. However, the open question is the relative importance of capital versus the importance of total factor productivity in the developing countries. So far, it seems that many developing countries start as factors driven economies, then, these countries shift to productivity driven economy.
- The institutions play a crucial role in the economic growth. The better the quality of the institutions the better the economic environment, which increases the productivity of the economy.
- The government consumption deteriorates the economic growth in the developing countries which have high corruption and low accountability in general.
- The inflation rate, as a proxy of the macroeconomic policies, affects the growth negatively for the economic growth. This result supports the importance of the stabilization in the developing countries.
- The Openness is important for growth since it is important to transfer the 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 deteriorates the growth rate, however the impact is insignificant. The representative ability of the indicator might matter.

Secondly, results and policy implications of section □□: 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 is relatively high comparing with the 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 the economic growth, but the structure of the production and exports are highly dependent on agriculture and mining sectors.
- The main sources of growth are the physical capital, labor and human capital respectively. That means the factor accumulation is the major source of growth in Syria in the study period. The next step is to shift to 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 the growth in agriculture (climate fluctuating) and the political instability (war, revolutions) which does not reflect any technological progress additionally it reflects the external and internal shocks. As results, 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 the Syrian economic growth analysis match the results of the cross countries empirics in Barro-Type model?

- testing Barro-Type model results in explaining Syria Growth:

  - There are some results which are in line with the Barro-Type results such as the economic growth in Syria associated with relative high domestic investment ratio; however 57% of it is public investment. It seems that the public investment has played positive role in economy however more in depth work need to analysis the structure of this investment, externalities, and the cost.

  - On the other hand, there are many other factors which might contradict with the Barro-Type model such as :

    - The quality of institutions are poor especially the accountability and the government efficiency which not explain the economic growth but could explain the low productivity and high volatility.
    - The government consumption is relatively high besides 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 could be chance to have more resources of human capital with one condition "invest in young people NOW"
    - 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 level in Syria are much more than the cross section estimations.

    - The causality in Syria between human capital and institutions need more careful research.
- The main conclusion that the new economic growth empirics could not explain in full 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 the expected role that the relative high growth rate in Syria associated with poor institutions, large size of government, closed economy and high population growth. Although, these factors considered the main determinants of growth rate according to Cross Countries Empirics, but they contradict, to a certain extent, with the case of Syria which shows a sustained growth during forties years of the studied period. Finally, it seems that institutions follows growth in Syria case.

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Appendix

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 towards GDP are 0.52, 0.24 and 0.24 respectively.

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