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Productivity and Future Political Economy: Cyprus

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Abstract

The paper attempts to generate simulated values for Total Factor Productivity (TFP) growth in North and South Cyprus between 1996 and 2003. Using estimated values of respective growth rates of output and physical capital per worker, we obtain alternative possible values of TFP growth, each based on a unique assumption about the growth rate of human capital per worker in each economy. Based on rough estimates obtained from the available data about number of immigrant workers and their education levels for North Cyprus, human capital per worker could be slightly declining in both North and South Cyprus. Based on this assumption, TFP growth seems to be slightly negative over the period of our study, which in turn, raises questions about the possible worsening of efficiency in resource allocation for both regions of Cyprus. In the second part of our paper we generate nine alternative combinations of "Internal Conditions" and "External Conditions" each of which represents a unique "Political Economy" scenario about North Cyprus for 2007-2015. Based on some assumptions we generate projections for the possible behavior of respective growth rates of 'TFP', physical capital per worker, human capital per worker and output per worker between 2007 and 2015.

Key words: Cyprus, efficiency, growth, human capital, immigration, physical capital, total factor productivity.

JEL Classifications: J24, O4.

1. Introduction

For over more than a decade, economists have used neo-classical growth model to analyse the behaviour of economic growth in the long-run. In its basic form, neo-classical model postulates that in the long run two critical factors determining growth are exogenously given: respective rates of technological progress and population growth. And, in the medium-term, accumulation of not only labour force which depends on the rate of population growth but also that of physical capital will play a critical role in determining the growth rate of the economy [14], [4]. However, in the last 10 to 15 years, the role of human capital in determining economic growth has received increasing attention in the literature which particularly focused on cross country differences in economic growth and productivity [17], [13], [19]. According to this view, human capital refers to the 'quality of labour' that a person supplies and this will depend on particularly the level of health and the degree of education of that person.

There have been various studies which attempted to relate differences in economic growth of different countries to differences in health environments of those countries or their differences in the number of years of schooling per worker [2], [5]. However, so far it has proved to be extremely difficult to measure the level of human capital per worker in a way which incorporates both health and education factors together in a measurable manner. Therefore, any study which attempts to analyse the behaviour of total factor productivity growth over time based on neo-classical model will have to use for 'quantity of labour supply' the raw data about the 'number of work force' (or hours of work) without taking into account the quality of labour supply per worker, or alternatively make some assumptions about the 'rate of growth of human capital per worker' and simulate the productivity growth over time based on each possible assumption and scenario.

In this study, we use Cobb-Douglas type of neo-classical production function to investigate and compare the total productivity growth in North and South Cyprus for the period of 1996-2003. Our methodology is based on estimating the respective growth rates of output per worker and physical capital per worker based on actual data for gross domestic product (GDP), total employment and

fixed capital investment data of both North and South Cyprus. Study's simulations regarding the behaviour of growth rate of total factor productivity are based on particularly alternative scenarios about the respective shares of physical and human capital in output. The organisation of the rest of the paper is as follows: In section two, we describe briefly the nature of the neo-classical production function, namely Cobb-Douglas type of production function and how it can be transformed into a "growth accounting equation" to analyse the sources of growth in terms of accumulation of physical and human capital stocks and productivity growth which is a result of both technological progress and growth in efficiency in using technology with inputs. In section three, using the estimated values of growth rates of output and physical capital per worker we compute and simulate the behaviour of productivity growth for both North and South Cyprus based on alternative scenarios about the respective behaviour of the growth rate of human capital per worker in each economy. In section four we briefly discuss the likely factors that can be the source of the possible negative trend in the growth of efficiency and the likely impact of immigration of unskilled labour force on the average amount of human capital per worker and implications for TFP growth over the period of our study. In section five we list nine political economy scenarios based on "Internal Conditions" and "External Conditions" that can prevail for North Cyprus over 2007-2015 period and use them to simulate alternative growth paths for output per worker. The last section concludes with summary and policy implications of results.

2. Growth Accounting

The general form of the neo-classical production function that can be used to analyse the relationship between output and inputs is given below by equation (1):

$$Y = AF(K, N). \quad (1)$$

Equation 1 relates total output, Y , to the economy's use of capital, K , and labour, N and productivity, A . For the quantity of output to grow, either the quantity of inputs must grow or productivity must improve, or both.

As Weil [19] shows productivity, A , can be written as:

$$A = T \times E, \quad (2)$$

where T = the level of technology, and

E = the level of efficiency.

In section four, we will use this important relationship in speculating about the possible causes of low productivity growth both in North Cyprus and South Cyprus that our simulation results have suggested.

As Abel and Bernanke [1] show, the neo-classical production function given by equation (1) can be expressed in growth rate for as follows:

$$\dot{Y} = \dot{A} + \alpha_K \dot{K} + \alpha_N \dot{N}, \quad (3)$$

where a dot over a variable indicates the rate of change in that variable or simply its growth rate as explained below:

\dot{Y} = rate of output growth,

\dot{A} = rate of productivity growth,

\dot{K} = rate of capital growth,

\dot{N} = rate of labour growth,

α_K = elasticity of output with respect to capital,

α_N = elasticity of output with respect to labour.

α_K and α_N lie between 0 and 1 and both must be estimated from historical data. Equation (3) is known as the growth accounting equation and it basically measures the relative importance of three sources of output growth, namely the productivity growth (\dot{A}), the growth in physical capital stock (\dot{K}) and the growth in labour input (\dot{N}).

One specific type of neo-classical production function used in empirical studies about sources of growth is Cobb-Douglas type of production function which exhibits constant returns to scale as given below by equation (4).

$$Y = AK^\alpha N^{(1-\alpha)}. \quad (4)$$

In equation (4) α represents the share of physical capital in national income and $(1-\alpha)$ represents the share of labour. However, as mentioned earlier in the introduction section, both theoretical and empirical research has been recently emphasizing particularly the ‘quality of labour supply’ instead of its quantity, which is captured by N in equation (4). In other words, if the quality of each worker changes, particularly in terms of education, skills and health, then the quantity of labour supply could be very different for the same number of workers depending on the amount of ‘human capital stock’ that each one of them possesses. Given this insight, let’s assume that h represents the ‘quantity of labour force’ for each worker and this quantity depends on the amount of human capital per worker. Given this, total amount of labour input in the country will be given by hN . Introducing this notation into Cobb-Douglas production function we obtain:

$$Y = AK^\alpha (hN)^{(1-\alpha)}, \quad (5)$$

Dividing both sides of the equation by N (number of workers) gives the production function in per worker terms as shown by Weil [19]:

$$y = Ak^\alpha h^{(1-\alpha)}, \quad (6)$$

where, y is output per worker and k is the physical capital per worker.

Physical capital and human capital are the two factors of production used as inputs in this production function. Now, we express equation (6) in growth rate form as in equation (7):

$$\dot{y} = \dot{A} + \alpha \dot{k} + (1-\alpha) \dot{h}. \quad (7)$$

Cobb-Douglas production function in this form suggests that growth rate of output per worker will depend on the growth rate of productivity, growth rates of physical and human capital stocks per worker and the value of α . As Weil [19] notes, the value of α is on average 1/3 for a large percentage of countries when they are taken as group.

Equation (7) forms the basis of our work for the comparative analysis of the behaviour of productivity growth in North and South Cyprus. As mentioned earlier, there have been some studies which attempted to measure the human capital per worker for certain countries based on the average number of the years of schooling. However, to our knowledge, there do not exist any reliable estimates regarding the growth rate of human capital per worker for most of the developing countries and particularly for North and South Cyprus.

Based on equation (7), we introduce the following growth equations for North and South Cyprus:

$$\dot{y}_N = \dot{A}_N + \alpha_N \dot{k}_N + (1 - \alpha_N) \dot{h}_N, \quad (8)$$

$$\dot{y}_S = \dot{A}_S + \alpha_S \dot{k}_S + (1 - \alpha_S) \dot{h}_S, \quad (9)$$

where N = North Cyprus,

S = South Cyprus.

In the next section, using the estimated values of \dot{y}_N , \dot{y}_S , \dot{k}_N and \dot{k}_S from historical data, we simulate the respective values of \dot{A}_N and \dot{A}_S (respective growth rate of productivity in North and South Cyprus) for alternative scenarios about the values of \dot{h}_N , \dot{h}_S , α_N and α_S .

3. Simulation Results for Productivity Growth

Equations (8) and (9) imply that productivity growth rate for North and South Cyprus will be given by the following relationships:

$$\dot{A}_N = \dot{y}_N - \alpha_N \dot{k}_N - (1 - \alpha_N) \dot{h}_N, \quad (8a)$$

$$\dot{A}_S = \dot{y}_S - \alpha_S \dot{k}_S - (1 - \alpha_S) \dot{h}_S. \quad (9a)$$

As we suggested earlier, even though historical annual data about GDP, total employment and fixed capital investment allow us to obtain estimates for the respective growth rates of output per worker and physical capital stock per worker, for most countries there is no reliable data even for the average number of years of schooling per worker (and its evolution over time) which has been used as a proxy for the stock of human capital per worker in some studies. This is particularly the case for North Cyprus where there has been increasing inflow of low-skilled cheap labour force from Turkey in the last decade. According to a study by Besim [3], the size of the unregulated labour force has been estimated to be approximately 27 000 in 1996 representing nearly 40 per cent of the labour force. There was almost no official data available for these unregulated guest workers until the summer 2005 at which time new coalition government has passed a new law that brings severe penalties for both illegal foreign workers and their employers. This law has formalized over 40 000 migrant employees as they had to register for work permit. Using past data based on SPO

[16] and PIO [11], we estimated the respective averages of \dot{y}_N , \dot{y}_S , \dot{k}_N and \dot{k}_S for the period of 1996-2004 as follows:

North Cyprus	South Cyprus
$\dot{y}_N = 0.007$	$\dot{y}_S = 0.020$
$\dot{k}_N = 0.036$	$\dot{k}_S = 0.057$

Our first scenario (Scenario A) is based on the assumption that the value of α is 0.4 for both North and South Cyprus. Given this, we first obtain the values of \dot{A}_N and \dot{A}_S for a base case which rests on the following assumptions about the values of α_N , α_S , \dot{h}_N and \dot{h}_S .

$$\alpha_N = \alpha_S = 0.4,$$

$$\dot{h}_N = \dot{h}_S = 0.01.$$

We note that the chosen value for α is close to the actual estimates for North Cyprus [10].

Our base case for the average values of the \dot{A}_N and \dot{A}_S for the period of 1996-2003 are obtained by substituting the estimated values of the y_N , y_S , k_N , k_S and the assumed values of α_N , α_S , \dot{h}_N and \dot{h}_S into equation (8a) and equation 9(a) to yield the results for what we call **Scenario A**.

In case 1 (base case) when, $\dot{h}_N = 0.01$ and $\dot{h}_S = 0.01$, the rates of productivity growth for North and South are:

$$\dot{A}_N = -1.32\%,$$

$$\dot{A}_S = -0.86\%.$$

Now we experiment with alternative values for \dot{h}_N and \dot{h}_S and see how the resulting values for \dot{A}_N and \dot{A}_S change. Results are presented in the table below under Scenario A column.

Table 1
Simulation Results of Productivity Growth under Different Scenarios for North and South Cyprus

Assumptions	Scenario A		Scenario B		Scenario C	
	$y_N = 0.007$	$y_S = 0.020$	$y_N = 0.007$	$y_S = 0.020$	$y_N = 0.007$	$y_S = 0.020$
	$k_N = 0.036$		$k_N = 0.027$		$k_N = 0.036$	
	$k_S = 0.057$		$k_S = 0.057$		$k_S = 0.057$	
	$\alpha_N = \alpha_S = 0.4$		$\alpha_N = \alpha_S = 0.4$		$\alpha_N = \alpha_S = 0.33$	
	\dot{A}_N	\dot{A}_S	\dot{A}_N	\dot{A}_S	\dot{A}_N	\dot{A}_S
Base Case	-1.32%	-0.86%	-0.98%	-0.86%	-1.12%	-0.55%
$\dot{h}_N = \dot{h}_S = 0.01$						
Case 2						
$\dot{h}_N = 0$ and $\dot{h}_S = 0.01$	-0.72%	-0.86%	-0.38%	-0.86%	-0.49%	-0.55%

Table 1 (continuous)

Case 3 • $\dot{h}_N = -0.005$ and • $\dot{h}_s = 0.01$	-042%	-0.86%	-0.08%	-0.86%	-0.15%	-0.55%
Case 4 • $\dot{h}_N = 0.01$ and • $\dot{h}_s = 0.005$	-1.32%	-0.56%	-0.98%	-0.56%	-1.15%	-0.22%
Case 5 • $\dot{h}_N = -0.01$ and • $\dot{h}_s = 0.01$	-0.12%	-0.86%	0.22%	-0.86%	0.18%	-0.55%
Case 6 • $\dot{h}_N = 0.02$ and • $\dot{h}_s = 0.02$	-1.92%	-142%	-1.58%	-1.46%	-1.82%	-1.22%
Case 7 • $\dot{h}_N = 0.005$ and • $\dot{h}_s = 0.005$	-1.02%	-56%	-0.68%	-0.56%	-0.82%	-0.22%
Case 8 • $\dot{h}_N = 0$ and • $\dot{h}_s = 0$	-0.74%	-0.28%	-1.1%	-0.28%	-0.28%	-0.74%
Case 9 • $\dot{h}_N = -0.02$ and • $\dot{h}_s = 0.005$	-0.46%	0.02%	-0.83%	-0.43%	0.83%	0.43%

Key: \dot{y}_N = rate of output growth per worker in the North;
 \dot{y}_S = rate of output growth per worker in the South;
 \dot{k}_N = rate of capital growth per worker in the North;
 \dot{k}_S = rate of capital growth per worker in the South;
 \dot{h}_N = rate of human capital growth per worker in the North;
 \dot{h}_s = rate of human capital growth per worker in the South;
 α_N = elasticity of output with respect to labour in the North;
 α_S = elasticity of output with respect to labour in the South.

Source: Serhan Ciftcioglu's own computations.

The simulations presented above critically depend on among other things, the estimated value of the growth rate of capital stock per worker. The estimate of this parameter, in turn, depends on the reported values of annual gross fixed capital formation and depreciation rate. Some researchers have estimated that for developing and underdeveloped countries of Middle East, North Africa, Sub-Saharan Africa and South Asia, the true growth rate of capital stock was less than half the growth rate one would believe from looking at official statistics [12]. This is particularly due to the fact that in most developing countries particularly corrupt government officials or politicians divert much of the money that is allegedly spent on investment in new capital along the way into other uses.

Secondly, the fact that most of the investment in developing countries is done by government, which tends to be less efficient than the private sector in converting investment into capital. Particularly the latter factor needs to be taken seriously for North Cyprus where relatively significant percentage of investment is carried out by public sector. This, in turn, means that the annual growth rate of capital stock that we estimated using the annual gross fixed capital formation can be an overestimate of the actual rate. In light of this insight, we redo our simulations regarding the total factor productivity growth rate over the period of 1996-2003 by assuming that the true growth rate of capital stock per worker for North Cyprus was only 75% of what we estimated based on the reported statistical data. With this assumption, (average) annual growth rate of capital stock per worker for North \dot{k}_N falls to 0.027. In what follows, we report the simulation results based on this assumption about the value of \dot{k}_N with $\alpha_N = \alpha_S = 0.4$ which we will call **Scenario B**. Even though the reported values of productivity growth for South are same as before (since there is no change in the value of \dot{k}_S) we introduce them together with the values for North so as to allow for comparative analysis of North and South Cyprus. The results of Scenario B are presented under the Scenario B column of Table 1 in the previous page.

In order to test the sensitivity of our results to varying values of α (the share of capital in national income) we simulated the results for the initial cases (from case1 to case 9 in Scenario A) for the α value of 1/3 for both North and South Cyprus which we will call **Scenario C**. In this case, the assumed parameter values for the Base case (case 1) are as follows:

$$\alpha_N = \alpha_S = 1/3, \quad \dot{h}_N = \dot{h}_S = 0.01.$$

The results are presented in Table 1 under Scenario C column.

In the next section, we first comment about the general nature of the simulation results and then attempt to obtain some rough estimate for TFP growth in North Cyprus based on some rough estimates about the decline in the average number of years of education per worker due to immigration of unskilled labour.

4. Analysis of Simulation Results

The most striking aspect of the simulation results is the fact that for most cases investigated Total Factor Productivity (TFP) seems to be negative for both North and South Cyprus. In other words,

the majority of values used for \dot{h}_N and \dot{h}_S resulted in negative values for \dot{A}_N and \dot{A}_S for the period of 1996-2003. Given the assumption that TFP has two components namely “technology” and “efficiency”, the negative value of A is much more likely to be caused by a decline in “efficiency” in using available factors of production with the existing state of technology, simply because negative growth in the level of “technology” seems highly unlikely.

One of the likely causes of a possible decline in “efficiency” in North Cyprus over 1996-2003 is the probable increase in the degree of misallocation of resources, and deterioration in the quality of public

sector management practices of the political governments. On the other hand, the adoption of strict rules and regulations of European Union in South in relation to environmental pollution, occupational health and safety and labour rights in the years before its entry in EU in 2004, could have led to cost increases particularly for labour intensive input combinations that might be relatively less efficient than before. This is an issue that may require careful analysis at sector level in the coming years.

For \dot{A}_N and \dot{A}_S to be positive over the period of our study, equations 8(a) and 9(a) together with the assumption that $\alpha_N = \alpha_S = 0.4$ suggest that the values of \dot{h}_N and \dot{h}_S must be less than -1.23% and -0.46% respectively. Given the dramatic increase in the number of unskilled workers we consider the possibility of a decline in human capital per worker in North and South Cyprus particularly over the period of 1996-2003 as a plausible scenario. The growing social problems associated with the dramatic increase in the legal and illegal immigration of largely unskilled labour force to North and South Cyprus have started receiving a great deal of attention both in media and among politicians and residents of the two economies. However, besides social and criminal problems caused by a given increase in the relative size of immigrant workers in total labour force, this could also lead to a decline in the quality of average unit of labour. In other words, the decline in the average amount of human capital per worker in both North and South Cyprus should be considered as more than a theoretical possibility.

The statistics given by Trimikliniotis and Demetriou [18] show that the number of "legally" employed migrant workers in the south was only 545 in 1990, 10 370 in 1996 and 30,225 in 2002. However, they argue that the total number migrant workers including the "undocumented workers" have reached 72 000 in 2004 which accounts for 16% of total working population in South Cyprus. In case of North Cyprus, official announcements that appeared in local press in 2005 have pointed out that, excluding the number of immigrants who were granted citizenship, the number of documented and undocumented (illegal) workers has reached 46 000 [7]. Most of these migrant workers are employed in construction, tourism, services and manufacturing sector. Considering the size of the population of North Cyprus which is approximately 270 000, the increase in the relative share of migrant workers in total labour force is obviously more dramatic than that of South Cyprus. Human capital per worker is usually measured by the number of years of education. Even though the differences in the quality of education can also be very important in explaining the differences in human capital levels between workers, the number of years of education seems to be probably the best possible parameter available to measure human capital. A survey of 308 immigrant workers¹ has yielded invaluable insights about the education levels of immigrant workers in North Cyprus [8]. Based on the results of this study and the official data about the education levels of total labour force of North Cyprus in 1996 (which is assumed to stay approximately constant for resident component of labour force until 2005)², we roughly estimated that the average years of education per worker has gone down by 0.3 years between 1996 and 2003 [15], [9]. And this corresponds to 0.47% (or approximately 0.5%) annual decrease in the average number of years of education per worker.

The simulation results presented in section three have shown that for all three scenarios investigated when $\dot{h}_N = -0.005$, the value of \dot{A}_N (TFP growth for North Cyprus) is negative; -0.42% for Scenario A, -0.08% for Scenario B and -0.15% for C. Unfortunately, we have been unable to find similar data about the education levels of immigrant workers in South Cyprus which could allow us to obtain a rough estimate about the possible impact of immigration on human capital per worker. However, in light of the fact that the relative share of immigrant workers in South Cyprus

¹ This survey was based on face to face interviews carried out in 2005.

² One important justification for this assumption is the fact that any improvements in the average amount of human capital of resident workers in this period were likely to be offset by the acceleration in brain drain due to stagnating economy and shrinking job opportunities particularly for relatively more educated segment of local labour force.

seems to be much less than that of North Cyprus, our educated guess is that a reasonable range of values for the average rate of growth of human capital per worker in South (between 1996 and 2003) is between 0% and -0.25%. The resulting range of values for \dot{A}_S under Scenario A and B is between -0.28% and -0.13%. In Scenario C where $\alpha_N = \alpha_S = 1/3$, the value of \dot{A}_S is between -0.07% and 0.12%. As noted earlier above our estimate for the value of \dot{A}_N over the same period (in case of Scenario A for example) is -0.42% indicating that the level of "efficiency" in North Cyprus has probably fallen between 1996 and 2003 at a higher rate than it has in South Cyprus.

5. Forecasts for Growth of Output per Worker in North Cyprus for 2007-2015

In this section we use our model to simulate alternative forecasts for the average rate of growth of output per worker over the nine years from 2007-2015 during which the solution of Cyprus problem seems like a remote possibility. The growth accounting equation that we used in our study identified the most important sources of growth as growth in TFP, physical capital per worker and human capital per worker.

Harberger [6] argues that TFP (which he likes to call 'real cost reductions') can be brought about in many different forms, the most important ones of which are: a) lowering inflation which is critical for economic agents to perceive the actual relative prices correctly so that they can make rational investment decisions; b) eliminating price control or interventions in credit markets; c) eliminating the costs imposed on an economy by ill-conceived regulations and bureaucratic hurdles; d) trade liberalization in the form of removal of tariffs, quotas and other kinds of protective measures; e) privatization that enables real cost reductions; f) a sound legal and institutional framework in which individuals are protected against arbitrary incursions on their property and other economic rights. On the other hand, expected real rate of return on capital is the key driving force of investment rate in a country, which plays a critical role in determining the physical capital per worker. The amount of human capital per worker largely depends on the skill level, education level and years of training and experience of the average worker.

In the light of the above discussion, we argue that given the present internal and external political economy conditions (IC and EC respectively) faced by North Cyprus; the investment rate is likely to be relatively more sensitive to a change in EC than it is to a change in IC. On the other hand, we believe that the opposite is true for the behaviour of the TFP; a relatively more favourable IC is likely to have bigger impact on the TFP than a relatively more favourable EC has. Later on we describe the three possible states for each one of the IC and EC that North Cyprus can face over the period of 2007-2015. In order to enable the uninformed reader to comprehend the specific assumptions and descriptions we will be making about these states of IC and EC for the future, we need to digress from the main topic of the paper and give a summary of "political economy" constraints and conditions faced by North Cyprus both domestically and internationally.

North Cyprus has been facing, in a sense, political and economic isolation from the rest of the world as only Turkey recognizes it as a separate state. One of the most dramatic consequences of the non-recognition has been the lack of direct travel or transportation between North Cyprus and the rest of the world except Turkey. In 2004 the majority of Greek Cypriots in South Cyprus rejected the U.N. plan aimed at the unification of the island in the framework of bi-zonal federation on the referendum. Turkish Cypriots who overwhelmingly said "yes" on the referendum still contrive to face political and economic isolation and efforts of Brussels to establish direct trade links with North Cyprus and extend financial assistance to Turkish Cypriots are facing the opposition of Greek Cypriots in the European Union.

In addition to unfavourable "external political economy constraints", North Cyprus has been plagued in the past with a variety of "internal political economy constraints as well". The most important one of these constraints has been the populist nature of political culture and the lack of accountability and

transparency in political and bureaucratic decision making processes particularly in relation to resource allocation. The credit allocation by government agencies, subsidies to agricultural sector, employment and promotion practices in public sector, protection of local industry through tariffs and through directed credit, degree of enforcement of laws regarding tax evasion and immigration policy were usually based on non-economic criteria. In addition, the bureaucratic deficiencies in producing long-term forecasts for energy needs, short-term horizons of politicians in investment decisions and resistance by unions against any kind of privatization of state electricity agency (and other state economic enterprises) resulted in serious bottlenecks particularly in energy supply.

5.1. Alternative States of Political Economy of North Cyprus

The “internal and external political economy conditions” described briefly above have been critical in determining the rate of physical and human capital accumulation, TFP growth and output growth in the past decade. For the future of North Cyprus, in particular for 2007-2015 period, we envision three distinct states for each one of the “internal political conditions” (IC) and “external political conditions” (EC) for North Cyprus that can prevail over 2007-2015:

Alternative States of Political Economy of North Cyprus over 2007-2015

A – Internal conditions	B – External conditions
A1) Highly favourable (HF)	B1) Highly favourable (HG)
A2) Favourable (F)	B2) Favourable (F)
A3) Unfavourable (U)	B3) Unfavourable (U)

The criteria that characterize each state for (IC) and (EC) separately are listed below:

A1) Criteria for “Highly Favourable IC” (HFIC)

Fulfilments of at least six of the following criteria are assumed to generate ‘Highly Favourable Internal Conditions’.

- a) Public sector reform that ensures qualification, skill and performance based promotion and employment and introduction of ‘Total Quality Management’ practices.
- b) Privatization of state economic enterprises, state controlled Airlines Company, state telecommunication and state electricity agencies.
- c) Large scale infrastructure investment particularly in energy supply, roads, ports, water supply and sewage systems.
- d) Complete trade liberalization.
- e) Elimination of all kinds of subsidies and government controlled credit allocation.
- f) Simplifying the tax system in the framework of a flat income tax rate of 20 percent for all income groups and making tax evasion a serious crime and having the will for serious tax collection.
- g) Minimising the bureaucracy needed for new business ventures and investment, and opening a new office for foreign investors through which all paperwork necessary for the foreign investment will be handled and concluded in less than one week.
- h) Introduction of new immigration policy, which allows “import of skilled labour” instead of “unskilled labour” in a strictly regulated manner.
- i) Formulation of “New Education Policy” which focuses on ‘vocational and technical training instead of classic university education’.

A2) Criteria for “Favourable IC” (FIC)

FIC criteria result from the fulfilment of at least three and at most five of all the criteria listed above for “HFIC” in part (A).

A3) Criteria for “Unfavourable IC” (UFIC)

Unfavourable internal conditions represent in general the populist political culture that prevailed in the past and in particular the fulfilment of at most two of the criteria that were listed for (HFIC) in part (A).

B1) Criteria for "Highly Favourable EC"

The political economy of North Cyprus over 2007-2015 period is assumed to face ‘highly favourable external conditions’ if the following criteria are met in the first 1-2 years of that period:

- a) United Nations sponsored talks aiming at finding a permanent settlement for Cyprus problem starts with the full-backing of European Union and both sides announce that they are optimistic.
- b) As part of the ‘Confidence Building’ measures and as an intermediate step for permanent solution of Cyprus problem, North Cyprus agrees to open closed and uninhabited part of touristic city of Famagusta for settlement of Greek Cypriots under UN control, and in return, international community agrees to develop direct trade links with Turkish Cypriots via official ports and airports of North Cyprus.
- c) Sustained financial and technical assistance of European Union and/or U.S to North Cyprus.
- d) Greater degree of representation of Turkish Cypriots in international organisations including European Union and, trade, science, education and technology related non-governmental organisations.

B2) Criteria for "Favourable EC" (FEC)

Only the criteria represented by c) and d) listed above for (B1) are satisfied in the first 1-2 years of 2007-2015 period.

B3) Criteria for "Unfavourable EC"

Unfavourable external conditions (UFEC) refer in general to the continuation of the present political and economic isolation of North Cyprus and in particular to the situation where none of the criteria listed under (B1) are satisfied.

For simplicity we assume that in statistical sense the states of ‘EC’ and those of ‘IC’ are ‘independent events’ meaning that the occurrence of a specific state of ‘EC’ does not change the probability of occurrence of any one of the states of ‘IC’ and vice-versa. Given this assumption, there are nine possible pairs of states of ‘IC’ and ‘EC’, each representing a specific scenario about the **‘General Political Economy Dynamics of North Cyprus For 2007-2015’**. We associate each scenario with specific outcomes regarding the respective growth rates of TFP, physical capital stock per worker and human capital per worker. These in turn yield a specific outcome for the growth rate of output per worker given the assumed values of the respective shares of physical and human capital in output.

In Table 2 below we list the nine alternative political scenarios for 2007-2015, discussed earlier above and then specify the specific assumptions that we made regarding the relative impact of each state of (IC) and (EC) on parameters of the model.

Table 2

Alternative Political Economy Scenarios for North Cyprus for 2007-2015

1	(ICHF, ECHF)
2	(ICF, ECHF)
3	(ICU, ECHF)
4	(ICHF, ECF)
5	(ICF, ECF)
6	(ICU, ECF)
7	(ICHF, ECU)
8	(ICF, ECU)
9	(ICU, ECU)

5.2. Assumptions about the Relative Impact of Each State of (IC) and (EC) on the Parameters of the Model

- a) At the risk of oversimplifying the reality, we assume that while states of ‘IC’ in general have a relatively larger impact on TFP than those of ‘EC’, ‘EC’ play a relatively more critical role in determining the rate of investment and therefore the growth rate of ‘physical capital per worker’. On the other hand we assume that ‘IC’ and ‘EC’ are equally important for the growth rate of human capital per worker.
- b) Given a fixed state of ‘EC’, the growth rate of TFP is 30% higher at a relatively more favourable state of ‘IC’ than it is at a relatively less favourable state of ‘IC’. For example, given a fixed state of ‘EC’, TFP growth, at the state of (HFIC) is 30% more than it is at the state of (FIC).
- c) Given a fixed state of ‘IC’, the growth rate TFP is only 15% higher at a relatively more favourable state of ‘EC’ than it is at a relatively less favourable state of ‘EC’.
- d) Given a fixed state of ‘EC’, the growth rate of physical capital per worker is 20% higher at a relatively more favourable state of ‘IC’ than it is at a relatively less favourable state of ‘IC’.
- e) Given a fixed state of ‘IC’, the growth rate of physical capital per worker is 30% higher at a relatively more favourable state of ‘EC’ than it is at a relatively less favourable state of ‘EC’.
- f) The growth rate of human capital per worker is 20% higher at a relatively more favourable state of EC (or IC) while facing a fixed state of IC (or EC).
- g) When the respective states for (EC) and (IC) are both ‘HF’, annual (average) growth rate of TFP is 1.3% which is equal to the average TFP growth attained by “highest growth” countries (in terms of output growth per worker) which make up top twenty percentile of all the countries [19].
- h) Furthermore we assume that the growth rate of physical capital per worker in North Cyprus under the joint occurrence of states of (ICHF) and (ECHF) is 5.4%, which is close to the comparable value estimated for South Cyprus (5.7%) for the period of 1996-2003. And finally we assume that the growth rate of human capital per worker under the joint occurrence of (ICHF) and (ECHF) will be 1% resulting from a variety of factors which include both a switch to relatively more selective immigration policy favouring import of skilled labour and at the same time the likely ‘reversal of brain drain’ which has plagued North Cyprus economy to this day due to unfavourable internal and external political economy dynamics.

In light of the above assumptions, we simulate the possible growth rate of output per worker for each one of the nine political economy scenarios that we listed earlier. We computed two alternative simulation results based on two alternative values of α (the output share of capital); $\alpha = 0.4$ and $\alpha = 1/3$. The results are presented below in Table 3, which specifies the value of growth rate of output per worker (y) that results from each possible political economy scenario for 2007-2015.

We note that, each outcome regarding y is a result of specific outcomes for the respective values of (k) , (h) and (A) that are generated by the political economy scenario in question.

Table 3*

Simulation Results for the Growth Rate of Output per Worker in North Cyprus Over 2007-2015**

No	Scenarios	\dot{A}	\dot{k}	\dot{h}	\dot{y}_a $\alpha = 0.4$	\dot{y}_c $\alpha = 1/3$
1	(ICHF, ECHF)	1.3	5.4	1	4.06	3.77
2	(ICF, ECHF)	0.91	4.32	0.80	3.12	2.88
3	(ICU, ECHF)	0.64	3.46	0.64	2.41	2.22
4	(ICHF, ECF)	1.11	3.78	0.80	3.10	2.90
5	(ICF, ECF)	0.78	3.02	0.64	2.37	2.21
6	(ICU, ECF)	0.55	2.42	0.51	1.82	1.70
7	(ICHF, ECU)	0.94	2.65	0.60	2.36	1.82
8	(ICF, ECU)	0.66	2.12	0.48	1.80	1.69
9	(ICU, ECU)	0.46	1.7	0.38	1.37	1.28

* The values given in the table are percentages.

** As a comparison, we note that output per worker in Taiwan had grown on average by 5.4% per year between 1966 and 1991 [20].

Source: Serhan Ciftcioglu's own computations.

One of the key insights that emerged from the simulation results given in Table 2 is that even when the 'EC' are unfavourable, if IC are highly favourable, output per worker grows at a relatively high rate particularly when the contribution of physical capital to output is relatively large.

This is revealed by the outcome of scenario No. 7 (ICHF, ECU) where the value of \dot{y}_a (2.36%) is very close to its value (2.37%) that is generated by scenario No. 5 where both (IC) and (EC) are favourable. The key parameter that drives this result is TFP growth, which is assumed to depend particularly on 'internal conditions' which to a certain extent depend on the quality of political leadership at home and the 'collective choices' made by the society at large in relation to social and economic reforms.

In other words, improvements in the TFP which depend not only on the rate of technological progress but also on improvements in "efficiency" can be a critical source of economic growth and development even if investment rate does not increase dramatically in the absence of favourable external conditions. Comparison of the simulation results for scenarios No. 3 (ICU, ECHF) and No. 7 (ICHF, ECU) reveals this insight even more strongly: Improvement of 'IC' from 'Unfavourable' to 'Highly Favourable' can, to a great extent, eliminate the negative impact of worsening of 'EC' from 'Highly favourable' state to 'Unfavourable' state. This is particularly evident for the case where the contribution of physical capital to output is relatively bigger.

Secondly, one can have an idea about the likely improvements in growth of output per worker and therefore in living standards of Turkish Cypriots that could result from a shift in USA and EU's present 'isolationist' policy for North Cyprus and allow Turkish Cypriots to engage in 'direct trade' with particularly EU. Under these circumstances that are represented by (ECHF), even if 'internal conditions' continue to be 'unfavourable' (ICU), the growth rate of output per worker could rise to 2.4 percent as shown by scenario No. 3 in Table 3 above. And this could generate substantial increase in welfare in medium-term.

Thirdly, as we can see from the comparative values of \dot{y}_a and \dot{y}_c , a relatively smaller contribution of physical capital to output results in a decrease in growth rate of output per worker for all the scenarios. This is largely due to the assumption that the highest growth rate of physical capital

per worker under the most optimistic scenario given by scenario No. 1 (5.4%) is much higher than the comparable value of the growth rate of human capital per worker (1%).

Finally we note that the respective values of \dot{A} , \dot{k} , \dot{h} , \dot{y}_a and \dot{y}_c are all approximately three times higher for scenario No. 1 (which represents the most optimistic political economy scenario) relative to scenario No. 9, the most pessimistic scenario for 2007- 2015. And this in turn, results in a dramatically much bigger percentage increase in output per worker from 2007 to 2015 for the optimistic scenario relative to the comparable percentage increase that takes place with the most pessimistic scenario. When $\alpha = 0.4$ the total percentage increase in the output per worker from 2007 to 2015 for scenario No. 1 is 43% whereas for scenario No. 9, the comparable value is only 15.6%. On the other hand, for $\alpha = 1/3$ the comparable percentages for total output growth from 2007 to 2015 are 34.5% (for scenario No. 1) and 12.1% (for scenario No. 9) respectively.

6. Conclusions

In the first part of our study we used our estimates for the actual growth rates of physical capital per worker and output per worker in North and South Cyprus for the period of 1996-2003 to simulate the comparative behaviour of TFP growth in the two economies for a variety of assumptions about their respective growth rates of human capital per worker. In order to allow for the possibility of a negative impact of immigration of relatively unskilled labour to both North and South Cyprus particularly after the second half of 1990's, we also included negative values for the growth rate of human capital per worker in our simulations. Using our rough estimate of approximately one half percent annual decrease in the (average) number of years of education per worker in North Cyprus between 1996 and 2004 as a proxy for the average growth rate of human capital per worker over the period of our study, we have shown that TFP growth for North Cyprus over 1996-2003 is likely to be negative (-0.42% when α equals 0.4). Similarly, based on our 'educated guess' of zero percent to -0.25 percent growth in human capital per worker in South Cyprus, its TFP growth is also likely to be slightly negative as well. The most likely source of a decline in TFP is the decline in the level of 'efficiency' with which the available resources are used together with the existing 'technology' in production.

In case of North Cyprus, one of the most significant sources of 'worsening of efficiency' over the period of our study is the likely increase in the degree of misallocation of resources. The increases in the extent of politically motivated public sector employment and promotion, and rent-seeking activity on the part of private interest groups in relation to farm and other types of subsidies, protection through higher import taxes, low-interest loans from state banks (which were most of the time not paid back) and government contracts seem to be some of the likely causes of 'misallocation of resources' that might have resulted in 'efficiency' losses and a possible decline in TFP.

In section five we generated projections for the future behaviour of growth rate of output per worker in North Cyprus based on nine alternative 'political economy scenarios' that we envisioned for 2007-2015 period. The outcomes about respective growth rates of TFP, and physical and human capital per worker were assumed to depend on the specific combination of 'Internal conditions' and 'External conditions' that may prevail in terms of political economy dynamics. Our most optimistic scenario based on the joint occurrence of 'Highly Favourable' states for both 'IC' and 'EC' suggests that output per worker may grow by approximately four percent annually from 2007 to 2015 and the total increase in output per worker can reach 43 percent depending on the relative output share of physical capital. One important insight that emerged from our simulation is the possibility of achieving reasonably high rates of TFP and output growth even in the absence of 'Favourable External Conditions' through generating 'Highly Favourable Internal Conditions'.

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