

Public expenditure and productivity puzzle: The case of Northern Cyprus

Abdul Ghafoor

Institute of Social Sciences, and Acting Dean, Faculty of Communications, Cyprus International University, Nicosia, Mersin 10 Turkey

Vedat Yorucu

Department of Economics, Eastern Mediterranean University, Gazimagusa, Mersin 10 Turkey

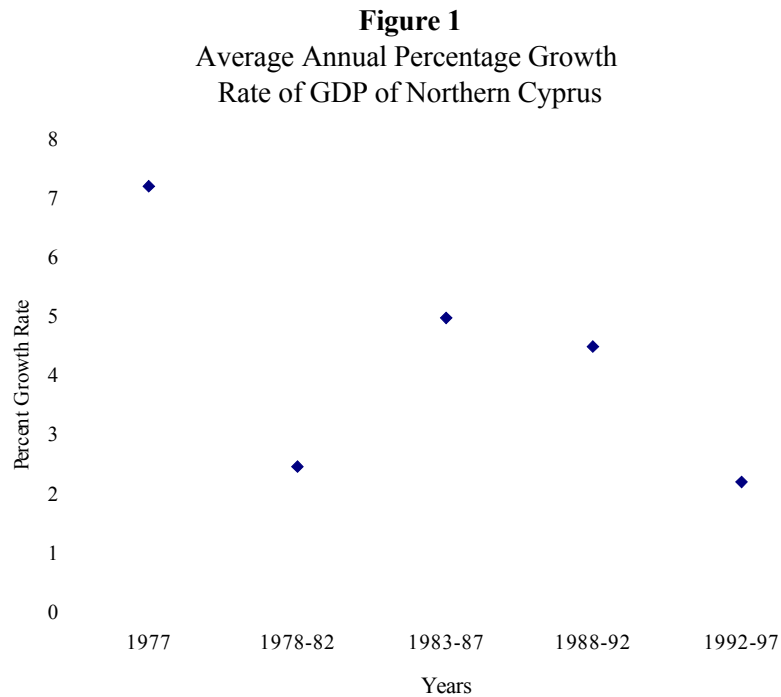
Abstract

Since 1974, Northern Cyprus has experienced very low productivity and very slow economic growth, which has further been declining in recent years. In searching for the causes of this poor economic performance emphasis is placed on the lack of investment in infrastructure and education. The present study intends to investigate the hypothesis that "the poor economic performance of Northern Cyprus is due to low levels of investment in infrastructure and education". In establishing the relationship between output and publicly provided inputs, we specify various Cobb-Douglas production functions by using aggregated and disaggregated time series data on public capital for the period of 1977-1998. Also, recently developed econometric techniques, such as cointegration and the error correction mechanism are used to test the validity of the data. Results indicate that both the long run and short run elasticities of GNP with respect to infrastructure and human capitals are very low and in most cases statistically insignificant. This implies that Northern Cyprus's poor economic performance in the past is not due to low investments in infrastructure and education, and that further investments in these sectors would not perform a miracle for the economy.

1. Introduction

In recent years, the economic performance of small island countries has been poor which has caused many deep-seated development problems. Economic growth has generally been low and many have experienced serious financial and macroeconomic instability. Northern Cyprus is not an exception. It has also experienced very low productivity levels and slow economic growth. A structural analysis of the Northern Cyprus

economy indicates that during the last two decades, growth in most economic sectors has been either stagnant or declining and the general trend in economic growth since 1977 has been that of decline (State Planning Organization, 1999) (see Figure 1).



Generally, this unsatisfactory performance can be attributed to a combination of factors, including constraints imposed by smallness, geographical remoteness and weak commodity prices. Since Northern Cyprus is also characterised as a small island economy with limited natural resources and a small internal market which limits economies of scale, the factors mentioned above could be considered to be important in explaining the poor economic performance of the past. However, since public policies affect and interact with economic growth in many ways, the importance of public investment in infrastructure and education cannot be ignored when searching for the causes of low productivity and slow economic growth. It is argued that the quality of health, education and infrastructure are affected by government activities such as taxes, public expenditures and budget deficits; thus, a carefully developed public policy can contribute to growth miracles. A wide range of empirical work by Aschauer (1989), Munnell (1990), Shah (1992), Bergman and Sun (1996) and Binder and Smith (1996) supports this idea. These studies conclude that a decline in productivity may have been induced by the slow expansion of public infrastructure investments in the past. They claim that

investments in safe water supply, electricity, roads and transport, may enhance the productivity of other economic factors of production, which would then lead to high economic growth in the long run. On the other hand, many researchers relate long term economic growth with investment in education. They argue that a poorly educated labour force is less productive and, therefore, any investment in education would not only enhance the productivity of the labour force but would also stimulate the productivity of other factors of production (Romer, 1986, Lucas, 1988, Barro 1990)¹.

It is a fact that the Northern Cyprus economy has been suffering from very low investment in infrastructure and education ever since its creation. For example, the ratio of infrastructure investment to GNP was only 2.68% during 1977-81. It increased to 3.97% during 1982-86, and since then has been declining (3.34% during 1987-91 and 3.32% during 1992-96). Although the trend in investments in education is upward (0.26%, 0.30%, 0.37% and 0.57% during 1977-81, 1982-86, 1987-91 and 1992-96 respectively), its share of the GNP is negligible. Such low investments may have occurred because the government budget has been reduced over the last two decades in order to stabilise price inflation, and the priority of public outlays has shifted from infrastructure and human capital development projects to equity related programs². Another reason may be the lack of information on the detrimental effects of such investments on economic growth. Once the productivity of publicly provided inputs is known, their effects on economic growth can be evaluated and a better public policy can be established (Ghafoor and Weiss, 2000). Therefore, it is worth investigating the hypothesis that “the poor economic performance of Northern Cyprus is due to low investment in infrastructure and education”. To test this hypothesis, the present study measures the long run and short run elasticities of public investments in infrastructure and education with respect to total output. It also performs a diagnostic analysis to establish a link between publicly provided inputs and economic growth. The study is novel in many ways. First, this type of empirical investigation has not been done before for Northern Cyprus. Second, the study uses both aggregated and disaggregated data of publicly provided inputs. Third, it performs (all possible) diagnostic analyses to check the validity of the data and the estimates.

The remainder of the paper is organised as follows. Section 2 discusses methodological issues. Section 3 presents the empirical results along with the econometric properties of the time series data. Policy

¹ Many human capital theorists such as Schultz (1961), Denison (1962) and Becker (1964) have done the earlier work on the relationship between education and growth.

² Equity related programmes include policies like early retirement, subsidies to the agriculture sector, subsidies on certain imported goods, etc.

implications of the study are discussed in section 4 and finally section 5 summarises and concludes our findings.

2. Methodological issues and model selection

The relationship between public capital and output is usually studied by estimating two types of production functions, namely, the Cobb-Douglas and translog functions. Equation (1) shows the simple form of the Cobb-Douglas production function.

$$Q_t = a + b_i (K_i)_t + cL_t + u_t \quad (1)$$

where Q_t is the aggregate output at time t , K_i is the i 'th component of capital and L is the labour input. The coefficients a , b and c are the parameters to be estimated. The main drawback of the Cobb-Douglas production function is that it assumes an elasticity of substitution of one between any two inputs. Alternatively some researchers have used the translog production function to estimate the elasticities of various inputs with respect to the output. Equation (2) shows the simple form of the translog production function.

$$Q_t = a + b_i (K_i)_t + cL_t + d_i (K_i)_t^2 + e (L_t)^2 + f_i (K_i L)_t + u_t \quad (2)$$

All variables are the same as those in equation (1). The squared terms capture possible returns-to-scale effects while the interactive terms enable one to assess the substitutability or complementarity across inputs.

In both types of production functions, where public capital is used as an input in addition to private capital and labour, it is assumed that the public capital provides an intermediate service to the private sector with a positive marginal product, just like other private inputs.

The present study estimates various forms of Cobb-Douglas production functions by using aggregated and disaggregated data for public capital. Our first model is similar to Aschauer's (1989)³ since we divide total capital into two broad categories of private and public capitals. If GNP represents the total output of the country, the functional form of such a model can be written as:

$$GNP_t = A_o (K_i^{b_i})_t (L^c)_t \quad (3)$$

³ For instance, Aschauer (1989) uses the Cobb-Douglas production function, which includes public capital in infrastructure in addition to private capital and a time counter variable 't' to incorporate the effects of disembodied technical progress. The following equation represents the Aschauer's model. $Q-K_p = a + bL + cK_p + dK_i + eCU + fT + u$ where K_p and K_i are the private and public infrastructure capitals respectively, CU is capacity utilisation and T is the time trend.

where K_i represents private and public capitals and L represents the labour input. Parameters b and c reflect partial elasticities of output with respect to private and public capital and labour respectively.

Since the function is nonlinear in its factors of production, the logarithmic form has been used to estimate the function directly by ordinary least squares. The log form of equation (3) can be written as:

$$\ln(GNP_t) = a + \ln b_1(K_{priv})_t + \ln b_2(K_{pub})_t + \ln c(L)_t + u_t \quad (4)$$

where K_{priv} is the total private capital and K_{pub} is the total public capital.

Since the literature provides strong evidence in favour of the relationship between human capital and economic growth, the importance of human capital as a fourth factor of production cannot be ignored. Its contribution becomes clearer when we look at both investments in and returns from human capital. It is argued that outlays for better qualification of the work force are about as high as the outlays for investment in infrastructure capital (Smolny, 2000). Therefore, to estimate the significance of investments in infrastructure and education for the long run and short run economic growth processes separately, the above model is extended by disaggregating total public capital into two subcategories, namely, physical capital (infrastructure) and human capital (education)⁴. This extended model is shown in the following equation (5).

$$\ln(GNP_t) = a + \ln b_1(K_{priv})_t + \ln b_2(K_{phy})_t + \ln b_3(K_{hum})_t + \ln c(L)_t + u_t \quad (5)$$

where K_{phy} and K_{hum} represents the public investment in infrastructure and education respectively.

For estimation purposes, all series are expressed in real terms using a constant price of 1977=100 and in natural logarithm forms. All data has been collected from the published material of the State Planning Organisation (1999).

Labour is the total number of employees in all sectors of the economy as given by the State Planning Organisation. The series for private, public, physical and human capitals are generated with the help of the following equation.

$$(K_i)_t = (K_i)_{t-1} + (\Delta K_i)_t \quad (6)$$

where K_i is the i 'th component of the capital at time t . $(K_i)_{t-1}$ represents the initial capital and the ΔK_i represents the change in capital in the current year; i.e., $(I_t - \text{Depreciation})$. Since 1974 marks the separation of Northern Cyprus from the rest of Cyprus, the figures given by the State Planning

⁴ This extended model is similar to the model of Garcia-Mila and McGuire (1992), which includes human capital (education) in addition to structure, equipment and highway investments as shown in the following equation:

$$Q = a + bK_{struct} + cK_{equip} + dK_{hw} + eK_{edu} + fL + u$$

Organisation for 1977 are taken as proxies for the initial private, public, physical and human capital levels. One can argue that there are better measures of human capital than investment in education, such as enrolment in schools, or the real cost of obtaining an education. Of course, there are, but such measures demand detailed data. For instance, observations on the enrolments at various schools over time are neither available nor consistent in the case of Northern Cyprus. Further, this measure is also not comprehensive since it does not include a large part of informal training, which is believed to be very important for human resource development. Data on the real cost of obtaining the resource is another alternative, which is also not feasible in our case. The only alternative left is to use the total cost of building the human capital, i.e., the total investment in education, which is not far from the reality since all education at the primary and secondary levels is financed by the government.

3. Empirical results

3.1 Econometric issues

Since it is likely that the time series variable may be nonstationary, it is common practice to examine the properties of the time series data as a guide prior to subsequent bivariate or multivariate modelling and inference⁵. Thus, this study begins with unit root testing of the data series. Two methods, the augmented Dickey-Fuller (1979, 1981) and the Phillips and Perron (1988) tests are commonly used to test for unit roots. To test the unit root property of the series X_t , we use the following regression equation.

$$\Delta X_t = c + \alpha X_{t-1} + \sum_{i=1}^p \gamma_i \Delta X_{t-i} + \varepsilon_t$$

(7)

where Δ is the first-difference operator and ε_t is assumed to be Gaussian white noise. The number of lags ' p ' in the dependent variable is chosen by the Akaike Information Criteria (AIC) to ensure that the errors are white noise⁶. Unit root tests of this type are called Augmented Dickey-Fuller (ADF) tests⁷. The null hypothesis is that the series is nonstationary against

⁵ If the time series are nonstationary, the standard OLS procedure for estimation will not be valid. In this case differenced data should be used for the estimation of the coefficient. However, in this way, we may lose the long-term relationship between the variables by taking the first (or higher order) differences. Alternatively one could still use the level data for regression analysis, if two or more data series in an equation are cointegrated.

⁶ Two methods, which are commonly used for the selection of lag length, are the Akaike Information Criteria (AIC) and the Schwartz Criteria (SC).

⁷ When the order of augmentation is zero, the ADF tests work as DF (Dickey and Fuller, 1979).

the alternative hypothesis of stationarity. The ADF test is based on the estimated parameter α and its corresponding t-statistics. When $\alpha = 0$, the time series X_t is non-stationary, which means that the standard asymptotic analysis cannot be used to obtain the distribution of the test statistics. The main problem with the ADF test is that it involves the inclusion of extra difference terms in the testing equation. This results in a loss of degrees of freedom and a resultant reduction in the power of the testing procedure, particularly when the number of observations is limited. Alternatively, the Philips-Perron (PP) approach allows for the presence of unknown forms of autocorrelation with a structural break in the time series, and conditional heteroscedasticity in the error term. It is based on testing the same regression equation as ADF except that $p = 0$. Since there are no such problems for the series under consideration⁸, the ADF test has been used to test for a unit root. For both tests, a t-statistic larger in absolute value than the critical value results in the rejection of the null hypothesis of a unit root in favour of the stationarity alternative. The results for unit root tests are presented in Table 1.

Results shows that the levels of all series under consideration are non-stationary and the null hypothesis of a unit root can only be rejected for the first difference. The ADF test for a unit root concludes that all series are integrated of order one, i.e., I(1).

Two nonstationary series of the same order are said to be cointegrated if their linear combination is stationary. In the present study, the number of variables in all equations is more than two and, according to Johansen (1991), all variables in the multivariate model should be of the same order of integration for vector autoregressive (VAR) estimation⁹. Since all variables under consideration are of the same order,

Table 1
Testing for a Unit Root

Variables	Augmented Dickey-Fuller Unit Root Test	
	Levels	1 st Difference
<i>GNP</i>	-0.0229	-3.5084*
<i>L</i>	-1.9913	-4.1818**
<i>K_{priv}</i>	-0.8802	-3.8321**

⁸ The Additive Outlier Person Test for unit roots with structural break was employed by using the following equation where D represents a dummy variable for the break year.

Results indicate that the effect of an exogenous break is insignificant.

⁹ Charemza and Deadman (1997), however, relax this condition and argue that the same order of integration for all variables is not a necessary condition for VAR estimation in a multivariate context. They assert that if the order of integration of the dependent variable is lower than the highest order of integration of the explanatory variables, there should be at least two explanatory variables of this highest order in an equation in order to be able to do a cointegration analysis.

K_{pub}	-1.3079	-4.0652**
K_{phy}	-1.5849	-3.2208*
K_{hum}	-1.7325	-4.2791**
MacKinnon Critical Values ^a		
1 %	-3.7856	-3.8067
5 %	-3.0114	-3.0199
10 %	-2.6457	-2.6502

^a The corresponding critical values are obtained from MacKinnon (1991).

The optimal lag length for the ADF test is chosen on the basis of the Akaike Information Criteria.

** and * indicate the rejection of null hypothesis of unit root at 1% and 5% level of significance respectively.

i.e., $I(1)$, the necessary condition of all variables of the same order can easily be met. The critical condition for the existence of cointegration is that the residuals from the estimated cointegrating regression be integrated of order zero, i.e., $I(0)$. Therefore the next step is to perform a cointegration analysis for all equations to find out if the variables in an equation are cointegrated. The existence of cointegration would confirm a long-run relationship among the variables in that equation.

Although the Engle-Granger (1987) method is widely used in the literature for cointegration analysis, it provides information only about the existence of a unique cointegrating vector. On the other hand, the Johansen full information maximum likelihood (ML) method provides information regarding all possible cointegration vectors in an equation (Johansen and Juselius, 1990). For instance, if there are N number of variables, there can be at most $r = N-1$ cointegrating vectors. Therefore, we have used the Johansen method for cointegration analysis. The cointegration results are reported in Table 2.

The results support the hypothesis that there are cointegration vectors among the relevant variables in all equations, which implies that there is a long run steady state linear relationship among the variables¹⁰.

Table 2
Results of the Cointegration Analysis

Equations	NH	AH	Eigen-values	LR Test Statistics	Critical Value	
					1%	5%
$GNP = f(L, K_{priv}, K_{pub})$	R=0	r=1	0.8783	76.7960**	54.46	47.21
	R≤1	r=2	0.6181	32.5495*	35.65	29.68
	R≤2	r=3	0.3814	12.3327	20.04	15.41
	R≤3	r=4	0.1014	2.2462	6.65	3.76
$GNP = f(L, K_{priv}, K_{phys}, K_{hum})$	R=0	r=1	0.9491	116.0925**	76.07	68.52
	R≤1	r=2	0.6811	53.5236*	54.46	47.21
	R≤2	r=3	0.5925	29.5180	35.65	29.68
	R≤3	r=4	0.3190	10.6641	20.04	15.41

¹⁰ The results for the long run impact of public inputs on output are discussed in the following section.

R<4	r=5	0.1162	2.5953	6.65	3.76
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“r” represents the number of cointegrating relationships.

** and * indicate the acceptance of null hypothesis of existing cointegration vectors at 1% and 5% level of significance respectively.

One thing that may undermine the true relationship among the variables is the nature of the model. If the adopted model is under-parameterised, over-parameterised or non-nested, then it would not be regarded as a true model and this problem is called a misspecification error. The main purpose of constructing a model is to systematically account for as much of the variation in the observations as possible. The movements not captured by the fitted model are termed residuals and, if the model is reasonably adequate, these residuals should be approximately random. Departures from randomness are an indication that the model has failed to pick up a systematic component in the observations, and an attempt should therefore be made to find a better model. Since residuals play an important role in procedures for detecting misspecification, all tests considered so far have been based directly on residuals, which indicate that there is no specification error in our models. It is however worth testing for a misspecification error in another way. For example, the RESET test developed by Ramsey (1969) is commonly used by econometricians where powers of explanatory variables are added to the regression equation and tested for significance. A similar approach has been used in this study to test for model stability. The results confirm our previous findings that there is no specification error in any equation. So our estimates would be valid and free from all possible econometric errors.

3.2 Long run elasticities

We begin by reporting results on long run elasticities of output with respect to various inputs. The estimation results are presented in Table 3.

Table 3
Long-run elasticities of various inputs for Northern Cyprus

Parameter	$= f(L, K_{priv}, K_{pub})$	$= f(L, K_{priv}, K_{phy}, K_{hum})$
<i>C</i>	1.6925 (0.49)	4.8940 (1.00)
<i>L</i>	0.4996 (1.48)	0.2021 (0.43)
<i>K_{priv}</i>	0.1594** (2.56)	0.1490** (2.21)
<i>K_{pub}</i>	0.0338 (1.07)	
<i>K_{phy}</i>	-	0.0513* (1.99)
<i>K_{hum}</i>	-	0.0275** (2.22)
R ²	0.98	0.98

DW	1.75	1.76
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*, ** and *** indicate that the coefficients are statistically significant at 10%, 5% and 1% levels.

The first column of the table shows the estimates from equation (4) where total capital is disaggregated into two broad categories of private and public capital. The R^2 value (0.98) indicates that the set of variables explains most of the observed variations in GNP. The elasticity of output with respect to public capital is positive (0.03) but statistically insignificant, and it is considerably lower than the ones reported by Aschauer (1989) and Munnell (1990a, 1990b), which are 0.36, 0.31 and 0.15 respectively. The elasticity of output with respect to private capital (0.16) is positive and statistically significant while the elasticity of output with respect to labour (0.50) is positive but statistically insignificant. The estimated overall returns to scale is only 0.69 ($0.4996 + 0.1593 + 0.0338$), which does not support any agglomeration economies and scale economies in the case of Northern Cyprus.

The estimation results of the extended model (equation 5) where public capital has been divided into two subcategories, namely, physical (infrastructure) capital and human capital (education) are shown in the second column of the Table 3. The output elasticities with respect to infrastructure (K_{phy}) and education (K_{hum}) are positive (0.0513 and 0.0275 for K_{phy} and K_{hum} respectively) and statistically significant at the 10% and 5% levels. However, the elasticity for education is well below that (0.16) reported by Garcia-Mila and McGuire (1992).

3.3 Short run elasticities

The estimates of cointegration regression parameters, presented in Table 3, may be superconsistent because of the static structure of the cointegration regression and the small sample size. Therefore, it is suggested that the lagged and difference terms be used, which implies an error correction mechanism (ECM) to test the short run adjustment towards the long run equilibrium and to explore the short run relationship between public inputs and output, if any. The ECM suggests that one should retrieve the residual from the regression equation as the equilibrium error and use it to tie the short run behaviour of the explanatory variable to its long run value (Engle and Granger, 1987). A general equation for the ECM can be written as follows.

$$\Delta y_t = \alpha + \beta_i \Delta x_i + \gamma u_{t-1} + e_t \quad (8)$$

where Δ is the first difference operator and u_{t-1} is the first lag of the error correction term. The coefficient γ is expected to capture the adjustment towards the long run dynamic equilibrium. A statistically significant value of γ tells us what proportion of the disequilibrium in y in one period is

corrected in the next period. The coefficients β_i indicate the short run elasticities of various inputs with respect to output.

In present study, the short run elasticities are estimated by the following equations.

$$\Delta(\ln GNP)_{t-1} = a + b_1\Delta(\ln K_{priv})_{t-1} + b_2\Delta(\ln K_{pub})_{t-1} + c\Delta(\ln L)_{t-1} + du_{t-1} + e_t \quad (9)$$

$$\Delta(\ln GNP)_{t-1} = a + b_1\Delta(\ln K_{priv})_{t-1} + b_2\Delta(\ln K_{phy})_{t-1} + b_3\Delta(\ln K_{hum})_{t-1} + c\Delta(\ln L)_{t-1} + du_{t-1} + e_t \quad (10)$$

The parameters of these equations have already been discussed. u_{t-1} in equations 9 and 10 is the first lag of the residual from equations 4 and 5 respectively. The regression results of these dynamic models including the error correction term are shown in Table 4.

For both equations, the error correction term is negative and statistically significant, which indicates that there is a strong tie between short run behaviour of GNP and its long run value. The magnitude of the coefficients indicates that almost 50% to 92% of any disequilibrium in the long run relationship between variables is successfully corrected after one year. The magnitudes of the short run elasticities tell more or less the same story. The results show that the short run elasticity of GNP with respect to total public capital is only 0.02 and statistically insignificant. When total public capital is disaggregated into physical and human capital, the magnitude of the short run elasticities becomes negligible.

From these results it may be concluded that the long run elasticities of GNP with respect to infrastructure and education are not only very small but are also statistically insignificant. Even in the short run, the investments in infrastructure and education have no significant impact on

Table 4

Short-run elasticities of various inputs for Northern Cyprus.

Parameters	Regression 1	Regression 2
<i>Constant</i>	0.0068 ^{NS} (0.57)	0.0383 ^{NS} (3.68)
$\Delta(L,1,2)$	0.7988 ^{NS} (1.07)	0.7997 ^{NS} (1.34)
$\Delta(K_{priv},1,2)$	0.0557** (2.20)	0.0394 (1.01)
$\Delta(K_{pub},1,2)$	0.0211 ^{NS} (0.04)	
$\Delta(K_{phy},1,2)$		0.0060 ^{NS} (0.76)
$\Delta(K_{hum},1,2)$		0.0039 ^{NS} (0.34)
Resid(-1)	-0.9296** (-2.15)	-0.5067* (-1.98)
R ²	49	42
DW	2.06	1.64

NS indicates an insignificant coefficient.

*, ** and *** indicate that the coefficients are statistically significant at 10%, 5% and 1% levels respectively.

GNP in the case of Northern Cyprus. In other words, the empirical evidence rejects the hypothesis set in the first section that the poor economic performance of Northern Cyprus is due to low investments in infrastructure and education. It means that low investments in infrastructure and education in the past have not contributed to the low productivity and slow economic growth. Thus, the study shares the criticism of Hulten and Schwab (1991) in the recognition that public investment in infrastructure does not have a direct impact on aggregate production, but may enhance overall production efficiency. The empirical results are also consistent with Barro (1991), Otani and Villanueva (1990) and Levine and Renelt (1992), since we found a very weak positive link between educational expenditure and economic growth. The discussion can be concluded by saying that the slow expansion of public investment may not account for the productivity slowdown in Northern Cyprus; but that, there may be other causes for the low productivity and slow economic growth in the case of Northern Cyprus.

4. Policy implications

Despite a debate on whether public capital affects output directly, i.e., as an additional input to the production function, or indirectly through capital and labour, it is well recognised that public investment has strong forward and backward linkages within the economy. For instance, public investment in infrastructure could generate employment opportunities, which in turn would increase real income and alleviate poverty. It may lower the production costs in the private sector since public investment is known as intermediate unpaid inputs for many industries. Above all, adequate and efficient provision of infrastructure can attract local and foreign investors. A composite effect of all these factors could bring a miracle to economic growth. On the other hand, public investment in infrastructure would be a part of government purchases on goods and services that require productive resources to be diverted from the private sector. Thus the government will compete with the private sector in factors, goods and capital markets. Consequently, public investment may crowd out private investment. Although many researchers believe that private sector capital productivity, enhanced by public investment expenditure, dominates the crowding out effect and creates a net rise in private investment, this result is dependent on the efficiency of public investments and the source of financing them. Since tax revenue is the main source of financing public investment, excessive government activities may give rise to an excess burden on taxpayers and may create

disincentive effects associated with the revenue-raising policies. Further, since taxes distort the resource allocation process, they may mitigate or even offset the positive effects of public investment. Moreover, it is also likely that excessive public investment may raise the income level higher than the output level, which would result in an increase in the price level and high inflation. Finally, public borrowing depletes the pool of savings available to the private sector and may raise interest rates. As a result private investment activities may be depressed.

Thus, the overall direction of the effect of public infrastructure investment on private investment and economic growth may vary from country to country or even from region to region depending upon their social and economic experiences. The empirical work reported in the last section concludes that the output elasticities with respect to infrastructure and education investments are positive but very small in the case of Northern Cyprus. The policy implications of these results suggest that investment in infrastructure and education would have very little effect on the productivity of private sector and overall economic growth. It means that in the case of Northern Cyprus, further public investments in infrastructure and education may not bring any miracle in economic growth; however, it may crowd out private investment because of its competitive nature.

Since Northern Cyprus can borrow only from Turkey, it incurs no interest and is not likely to repay. Thus, the government has no fear of increasing debt. However, this type of borrowing leads to a higher income level, which causes high inflation. Since the Northern Cyprus economy is characterised by high inflation and high interest rates, private investors prefer to keep money in the bank rather than use it for investment. This behaviour of the private sector forces the government to extend its activities to fields other than that of social goods. Hence, the public sector has grown very rapidly and gradually replaced the private sector. Further, a limited domestic market, restricted international trade and a high wage rate has left no choice for the private sector but to shift their investments either to Turkey or to any other neighbouring country. Consequently, not only has the extent of private activities decreased over time, but the marginal productivity of private capital and labour has declined as well as it is evident from our empirical results. In this situation, the encouragement of the private sector should be the first priority in the development of fiscal policy. An efficient and productive private sector could bring the economic growth back on track. Therefore, it can be suggested that the government should adopt private sector-leading policies where private investments are followed by public investment in infrastructure and education, which will not only contribute to private sector productivity but will also alleviate severe congestion and save scarce public resources.

5. Conclusions

Since it is believed that, in the case of Northern Cyprus, low productivity and slow economic growth may be due to low investment in infrastructure and education in the past, the purpose of this study was to investigate this hypothesis. Empirical results show that public investment in infrastructure and education do not exhibit a significant relationship with economic growth in the case of Northern Cyprus and thus we reject the hypothesis. In other words, further investment in infrastructure and education may not perform any miracle in economic growth; it may, however, crowd out private investment because of its competitive nature.

In searching for the causes of poor economic performance, the political position of Northern Cyprus is very important. Since the country has not yet been recognised by the world community and consequently a number of international embargoes have been placed on social and economic activities, local and foreign investors are afraid to invest in Northern Cyprus. Furthermore, high inflation, a high interest rate, limited domestic market coupled with restricted international trade and high wage rates have left no incentive for private investors. However, empirical results reveal that it is private investment that makes a positive and significant contribution to economic growth. Therefore, the government should establish policies that will attract private investors. Further, it would be better if private investments are followed by public investment in infrastructure and education, which will not only enhance private sector productivity but will also alleviate severe congestion and save scarce public resources.

References

- ALI, C. and CASSOU, S. P. (1995), "A Normative Analysis of Public Capital", *Applied Economics*, 27, 1201-1209.
- ASCHAUER, D. A. (1989), "Is Public Expenditure Productive?", *Journal of Monetary Economics*, 23 (2), 177-200.
- BARRO, R. J. (1990), "Government Spending in a Simple Model of Endogenous Growth", *Journal of Political Economy*, 98, S103-S125.
- (1991), A Cross-Country Study of Growth, Saving and Government, in: Bernheim, B. D. and Shoven, J. B. (eds), *National Saving and Economic Performance*, Chicago, University of Chicago Press.
- BECKER, G. S. (1964), *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*, New York: Columbia University Press.
- BERGMAN, E. M. and SUN, D. (1996), "Infrastructure and Manufacturing Productivity: Regional Accessibility and Development Level Effects", in D.F Batten and C. Karlsson (eds), *Infrastructure and The Complexity of Economic Development*, New York: Springer.

- BINDER, S. J. and SMITH, T. M. (1996), "The Linkages Between Transportation Investment and Productivity: A U.S. Federal Research Perspective", in D.F. Batten and C. Karlsson (eds), *Infrastructure and the Complexity of Economic Development*, New York: Springer.
- CHAREMZA, W. W. and DEADMAN, D. F. (1997), *New Directions in Econometric Practice: General to Specific Modelling, Cointegration and Vector Autoregression*, (2nd ed.) Cheltenham: Edward Elgar.
- DENISON, E. F. (1962), *The Source of Economic Growth in the US and the Alternatives Before the US*, New York, Committee for Economic Development (Supplementary Paper No 3).
- DICKEY, D. A. and FULLER, W. A. (1979), "Distribution of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association*, 79, 355-367.
- (1981), "The Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root", *Econometrica*, 49, 1057-1072.
- ENGLER, R. F. and GRANGER, C. W. J. (1987), "Cointegration and Error Correction: Representation, Estimation and Testing", *Econometrica*, 55 (2) 251-276.
- FINN, M. (1993) "Is All Government Capital Productive?", *Federal Reserve Bank of Richmond Economic Quarterly*, 79, 53-80.
- GARCIA-MILA, T. and MCGUIRE, T. J. (1992), "The Contribution of Publicly Provided Inputs to State' Economies", *Regional Science and Urban Economics*, 22 (2), 229-241.
- GHAFOOR, A. and WEISS, J. (2000), "The Impact of Structural Adjustment Reforms on Public Sector Expenditure: Evidence from Developing Countries", *METU Studies in Development*, 27 (1-2), 119-132.
- GUJARATI, D. N. (1995), *Basic Econometrics* (3rd ed), New York: McGraw-Hill International Edition.
- HULTEN, C. and SCHWAB, R. (1991), *Public Capital Formation and the Growth of Regional Manufacturing Industries*, University of Maryland, College Park, MD, Unpublished Working Paper.
- JOHANSEN, S. (1991), "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models", *Econometrica*, 55, 1551-1580.
- JOHANSEN, S. and JUSELIUS, K. (1990), "Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money", *Oxford Bulletin of Economics and Statistics*, 52, 169-209.
- KROL, R. (1995), Public Infrastructure and State Economic Development, *Economic Development Quarterly*, 9 (4), 331-338.
- LEVINE, R. and RENELT, D. (1992), "Sensitivity Analysis of Cross-Country Growth Regressions", *American Economic Review*, 82, 942-963.
- LUCAS, R. E. (1988), "On the Mechanics of Economic Development", *Journal of Monetary Economics*, 22 (1) 3-42.
- LYNDE, C. and RICHMOND, J. (1992), "The Role of Public Capital in Production", *Review of Economics and Statistics*, 74, 37-44.
- MACKINNON, J. G. (1991), "Critical Values for Cointegration Tests", in *Long Run Economic Relationships: Readings in Cointegration*, Engle, R. F. and Granger, C. W. J. (eds) New York: Oxford University Press, 267-276.
- MUNNELL, A. H. (1990a), "Why has Productivity Declined? Productivity and Public Investment", *New England Economic Review*, January/February, 3-22.
- MUNNELL, A. H. (1990b), "How does Public Infrastructure Affect Regional Economic Performance?", *New England Economic Review*, September/ October, 11-32.

- OTANI, I. and VILLANUEVA, D. (1990), "Long Term Growth in Developing Countries and Its Determinants: An Empirical Analysis", *World Development*, 18, 769-783.
- PHILIPS, P. C. B. and PERRON, P. (1988), "Testing for a Unit Root in Time Series Regression", *Biometrika*, 75, 335-346.
- RAMSEY, J. B. (1969), "Tests for Specification Errors in Classical Linear Least Squares Regression Analysis", *Journal of the Royal Statistical Society*, 31, 350-371.
- RAMSEY, J. B. and SCHMIDT, P. (1976), "Some Further Results on the Use of OLS and BLUS Residuals in Specification Error Tests", *Journal of the American Statistical Association*, 71, 389-90.
- ROMER, P. M. (1986), "Increasing Returns and Long-Run Growth", *Journal of Political Economy*, 94 (5), 1002-37.
- SCHULTZ, T. W. (1961), "Investment in Human Capital", *American Economic Review*, 51, 1-17.
- SHAH, A. (1992), "Dynamics of Public Infrastructure, Industrial Productivity and Profitability", *Review of Economics and Statistics*, 74 (1), 28-36.
- SMOLNY, W. (2000), "Sources of Productivity Growth: An Empirical Analysis with German Sectoral Data", *Applied Economics*, 32, 305-314.
- STATE PLANNING ORGANISATION (1999), *Economics and Social Indicators*, Nicosia, Northern Cyprus.
- WORLD BANK (1994), *World Development Report: Infrastructure for Development*, Oxford: Oxford University Press.

Özet

Kamu harcaması ve üretkenlik bilmecesi: Kuzey Kıbrıs örneği

1974'ten günümüze kadar Kuzey Kıbrıs'ta çok düşük bir üretkenlik artışı ve çok yavaş seyreden bir kalkınma hızı gerçekleşmiştir. Bu durum son yıllarda daha da kötüleşmiştir. Kötü ekonomik performansın nedenleri araştırıldığında, Kuzey Kıbrıs ekonomisinin Kuzey Kıbrıs'ın varoluşundan günümüze kadarki dönemde gerçekleşen altyapı yatırımları ve eğitim harcamalarının yetersiz oluşu nedenlerine bağlı olduğu düşünülmektedir. Bu çalışma, "Kuzey Kıbrıs'ın kötü ekonomik performansının düşük alt yapı ve eğitim harcamalarına bağlı olduğu" hipotezini araştırmayı amaçlamaktadır. Çalışmada, 1977-1998 dönemini kapsayan kamu sermayesi ile ilgili bütüncül (aggregated) ve bölüntülenmiş (disaggregated) zaman serisi verileri kullanılarak bir dizi Cobb-Douglas üretim fonksiyonu belirlenmektedir. Verilerin geçerliliği, ekonometrik eşbütünleşim (cointegration) ve hata düzeltme (error correction) yöntemleri ile test edilmektedir. Uzun dönem ve kısa dönem esnekliklerine bakıldığında, GSMH ile altyapı ve GSMH ile beşeri sermaye arasındaki ilişkinin hem çok küçük, hem de çoğu kez istatistik olarak anlamsız olduğu sonucu ortaya çıkmaktadır. Bunun sonucunda Kuzey Kıbrıs'ın geçmiş dönemlerdeki kötü ekonomik performansının düşük altyapı ve eğitim yatırımlarına bağlı olmadığı görülmekle beraber ileride bu sektörlere yapılacak ek yatırımların da kötü ekonomik performansın ortadan kalkmasına mucizevi bir katkıda bulunmayacağı anlaşılmaktadır.