

## Is There Externality from the Government Sector and the Non-Government Sector? A Feder Model Approach

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**Abstract:** This paper extended the Feder model to investigate the relationship between debt burden and economic growth in Turkey for the 1958-1996 and 1981 and 1996 period. This study employs the two-sector production function framework developed by Feder (1982). The estimation results show that there are substantial differences factor productivities exist between the government sector and the non-government sector. When we calculate the factor productivity differential between government and non- government sector for the period of 1958-1996 and 1981-1996 period, productivities for the period of 1958-1996 ( $\delta = 0.96$ ) is lower than the period of 1981-1996( $\delta = 0.82$ ).

**Key words:** External Debt, Turkey and Externality

### 1. Introduction

The external debt and economic growth association have been highly investigated since 1980s. During the 1980s the question of how to perform economic growth in less developed countries (LDCs) become more difficult because of heavy debt burdens. Several countries have been investigated and the bulk of studies have been published in the last 20 years. These studies show that the relationship between external debt service and economic growth is still a controversial one. Some studies found that there is a negative relationship between external debt and economic growth. Deshpande (1992) and Cunningham (1993) showed that a strong negative relationship exists. Sawada (1994) and Bauerfreund (1985) indicated that external debt leads to decrease investment and economic growth. Rockerbie (1994) found that external debt obligations have a significant negative effect on economic growth.

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On the other hand, Sawhney and Dipietro (1991) showed that debt had a negative coefficient and the debt was becoming larger for 1980-86 than the period of 1965-1980. This implies that the debt situation has worsened in 1980's as compared to 1970's. However, there some studies with causality in the literature, for example, Afxentiou and Serletis (1996) concluded that there is no causal relationship between GDP growth rate and foreign debt service. Afxentiou (1993) revealed that indebtedness affected economic growth negatively. Cohen (1993) showed that external debt has not affected GDP growth rate. Given these findings, it is difficult to say whether external debt service has a negative or positive effect on economic growth. More research needs to be done in this area.

The above studies showed that the effects of external debt service differ among countries. Based on these mixed results, it is improper to make any type of generalizations of the potential relationship between economic growth and external debt. Thus, in designing a recovery policy aimed at facilitating the external debt burden and promoting economic growth, it is necessary to consider the case of each developing country separately. Such a recovery policy should be based on the country's interrelationships between its GNP and external debt (Chowdhury, 1994). Moreover, cross-sectional studies give limited evidence for the external debt-growth relationship. Cross-country analysis is not easy and has some difficulties. Due to a lack of individual country studies and some problem with cross-sectional studies, time series analyses for a single country is more reliable than cross section analyses (Sezgin, 1997). Thus, it would be better to consider studies based on time series data for as many countries as possible (Ram, 1986).

This study focuses on Turkish external debt burden. Turkey spends a higher proportion of its GDP to external debt service. External debt service should have an important effect on Turkish GNP. This study hypothesized that Turkey's external debt service should have a negative impact on Turkish GNP. This study is also encouraged by the lack of country studies in the external debt-economic growth literature. Apart from (Karagöl, 2002), there is no actual empirical estimates of the impact of the debt problem on indicators of economic growth have been provided for Turkey. Furthermore, studies generally analyse the debt effect for developing countries that concentrate on the impact on investment or saving levels rather than on economic growth. It is very important to examine how the external debt affects the Turkish economic growth.

This paper proceeds as follows: In the next section, we will give a theoretical background of external debt and economic growth. The third section is about model and data sources are presented in section four. Fifth section gives estimation results and finally, last section is about concluding remarks.

## **2. Estimation of External Debt Burden And Economic Growth**

The purpose of this paper is to estimate the debt overhang impediment to Turkish economic growth by the Feder model. In this context, we argue that the country's level of indebtedness might affect the GNP in the following ways:

1. According to Chowdhury (1994), the higher the level of indebtedness, the larger the country's leverage, the more limited the external sources of credit, and the greater the number of incidences of financial distress and liquidation adversely affecting the GNP directly and indirectly through discouraging the GNP level directly and indirectly through discouraging domestic investment.
2. Furthermore, an increase in the public and publicly guaranteed external debt might indirectly depress the level of GNP by discouraging capital formation and encouraging capital flight due to tax increase expectations. Governments raise taxes a method of financing external debt obligations.

Savvides (1992) states that the debt induced taxation of capital decreases net returns to investment in indebted countries. Thus, from the perspective of the debtor country as a whole, the debt overhang acts like a high marginal tax rate on the country lowering the return to investment and providing a disincentive to domestic capital formation. It is argued that debt service payments impose a direct burden on indebted countries. This burden is measured by summing up interest and amortization payments to GNP. Heavy debt burdens prevent countries from investing in their productive capacity, investment necessary to spur economic growth. Disincentives to investment arise for reasons largely related to investor's expectations about the economic policies required to service debts:

Indeed, Turkey received the substantial amount of external assistance in the form of loans, debt relief and other aid when Turkey was in the balance of payments crisis of the 1970's. It makes sense to measure what is the effect of the both oil shocks on the Turkish economy. It is also important to investigate what has been done with that borrowing. This study is different from the other studies in several respects. Firstly, we used longer and recent data for estimation of external debt burden and economic growth, using the Feder type model. Secondly, unlike previous studies, we used employed labour force as a proxy variable for labour. Other studies used different proxy variables. Finally, Turkey had experienced an external debt crisis in the 1970s. This paper allows us to evaluate the consequences of the debt crisis.

## **3. The Model**

This study is focusing on the relationship between the debt burden and economic growth in Turkey and employing the two-sector production function framework

which is developed by Feder (1982). Feder (1982)<sup>1</sup> employed this model to study the relationship between the export and economic growth for a group of the semi-industrialised less developed countries. The analytical framework of the model is incorporating the possibility that the marginal factor productivities are not the equal in the government and non-government sector. Ram (1986) utilized Feder type model to study the government size and economic growth relationship for across-section and time series analysis. Sezgin (1997) used this model to estimate the relationship between the defense expenditures and economic growth association for Turkey during the 1950-1994. Other studies are employed this model to investigate the relationship between economic growth and other different indicators.

This model assumes the following major assumptions:

1. It is assumed that economy consists of two sectors, the government sectors and non-government sector.
2. If output in each sector depends on the labour (L) and capital (K),
3. If output of the government (G) sector causes an externality to output in the non-government sector (N).
4. The production functions for the government and non-government sector are different. The relative marginal products of inputs are different from the one sector to the other sector.

The production function for two sectors is as follows:

$$N = N(L_n, K_n, G) \quad (1)$$

$$G = G(L_g, K_g) \quad (2)$$

Where

N= Non- government sector

G= Government sector

L<sub>n</sub> = Labor forces in non-government sector

K<sub>n</sub> = Capital stocks in non-government sector

L<sub>g</sub> = Labor forces in government sector

K<sub>g</sub> = Capital stocks in government sector

One can get the effect of the government size and externality effect separately.

$$\frac{\dot{Y}}{Y} = \beta_1 \frac{\dot{L}}{L} + \beta_2 \frac{\dot{I}}{Y} + \left( \frac{\delta}{1+\delta} - \theta \right) \frac{\dot{G}}{Y} + \theta \frac{\dot{G}}{G} \quad (3)$$

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<sup>1</sup> see the full model in Feder (1982).

Where  $I$  and  $Y$  are investment and GNP respectively.

Equation (4) gives only the externality effect of government size, and not total effect.

$$\frac{\dot{Y}}{Y} = \beta_1 \frac{\dot{L}}{L} + \beta_2 \frac{\dot{I}}{Y} + \theta \frac{\dot{G}}{G} \quad (4)$$

#### 4. Data

The data for this study is for the 1958-1996 and 1981-1996 period. In order to see the effects of external debt until 1994 crisis, we used time series for the 1958-1996 periods. All financial data were deflated to 1987 millions Turkish liras using GNP deflators of SIS (The State Institute Statistics Turkey). The external debt data are obtained from the UT (the Undersecretaries of Treasury, Turkey) and SPO (State Planning Organization). Data about external debt for 1955-1964 are taken from SPO Turkey, *Economic and Social Indicators*, 1950-1998. We obtained the data on physical capital, which is proxied by the real gross domestic investment and economic growth from the SPO and the SIS. Labour force data was extracted from the OECD labour force statistics from 1960-1996. The data between 1955 and 1959 are not available either from the OECD or SIS Turkey, so it was created from the population statistics using labour force/population ratio. Population data were taken from SIS Turkey. Labour force is proxied by the employed labour force. Although Turkey has high population growth rate, we used labour force as a proxy in our estimation instead of the population growth rate. Despite the high rate of population growth in Turkey, the high rate of employed labour force, especially skilled labour force, may give an incentive to the Turkish economy to grow. Therefore, labour force is assumed to foster the economic growth. The rate of population growth is used as a proxy variable in place of the rate of increase in labour input in several studies.

#### 5. Empirical Results

Augmented Dickey-Fuller (ADF, see Dickey and Fuller, 1979) test is employed to examine whether these time series have a stochastic trend in their underlying data generating process and thus, are non-stationary. Table 1 presents the ADF test results for the log levels of all variables and first differences of logs of first differences. The result of the ADF test shows that time series are not stationary in levels. Furthermore, we calculated ADF test for first differences. On the basis of Table 1 all variables are stationary in first differences. These results indicate that our time series are integrated of order 1,  $I(1)$ .

The main objective of this study is to get at least the direction of the overall effect of government sector (with debt burden) on economic growth, and the sign of the externality effect parameter and the intersectoral productivity differential ( $\delta$ ). In the equation (3),  $\beta_1$  indicates the elasticity of non-government output  $N$  with respect to labour ( $L$ ),  $\beta_2$  is the marginal product of  $K$  in the non-government ( $N$ ) sector and  $\theta$  represents the elasticity of non-government output with respect to  $G$  (government) sector. It reflects that if a percent increase in  $G$ , this causes the percentage increase in non-government output.

**Table 1** : Unit Root Tests Results:

Level	First Differences								
	Vari- ables	T-ADF	Lag	Criti- cal values: 5 %	Criti- cal values: 1 %	First Differ- ences T- ADF	Lag	Criti- cal values: 5 %	Criti- cal values: 1 %
	Y	-4.8315	1	-2.94	-3.612	-9.6635	1	-2.942	-3.617
	L	-3.5468	1	-2.94	-3.612	-6.2097	1	-2.942	-3.617
	I / Y	-2.0694	1	-2.94	-3.612	-5.4177	1	-2.942	-3.617
	G / Y	-6.4063	1	-2.94	-3.612	-9.1739	1	-2.942	-3.617
	G	-5.2922	1	-2.94	-3.612	-8.3340	1	-2.942	-3.617

Additionally, if  $\delta$  is a constant parameter equation (3) gives a specification to estimate  $\delta$  and  $\theta$ . These show the intersectoral factor productivity difference and marginal externality effect of government output on the rest of economy and therefore economic growth respectively. Moreover, with equation (3), one can get the effect of the government size and externality effect separately. But, one cannot get the effect of the government size effect and externality separately from the equation (4). Moreover, there is a disadvantage for the equation (3). Ram (1986) indicates that while there is a collinearity between  $(G)$  and  $(G/Y)$  may cause to lower precision in the estimation equation (3).

Table 2 contains the main results from time series analysis. The estimates are given for equations (3) and (4), which are estimated to test the effect of debt burden

on overall economic growth through the externality effect and/ or because of the sectoral factor productivity differential. In equation (3), we test the effect of the debt burden on the GNP growth rate with the 1973 oil crisis. Due to heavy borrowing as a consequence of the increase in oil prices during 1974-1977, many countries faced debt service payments. Moreover, after the second oil crisis in 1979 and anti-inflationary macro economic policies practised by developed countries, after that the developing countries positions were drastically worsened. Since Costa Rica's default in 1981 and Mexico in 1982, the developing countries situations have now been recognized by developed countries (Cunningham, 1993). The result shows that the 1973 oil crisis effect is not significant. It means that the 1973 oil crisis had not affected strongly the Turkish economy in terms of GNP. Actually, strong negative relationship would be expected between DUM1973 and GNP.

**Table 2 :** Dependent Variable: GNP Growth Rate Sample Period: 1958-1996 Number of Observations: 39

Variables	EQ(3)		EQ(4)	
	Coefficients	T-values	Coefficient	T- values
Constant	0.003953 1	-0.602	-0.0045307	-0.670
$\Delta L$	0.60713**	2.088	0.71449**	2.441
$\Delta I/Y$	1.1978**	4.284	1.2972***	4.601
$\Delta G/Y$	-0.84047*	-1.751		
$\Delta G_{-1}$	-0.019215**	-2.706	-0.015014**	-2.181
DUM1973	0.040025	-0.956	-0.034359	-0.800
$\delta$	-0.96			
Test Results				
R <sup>2</sup>	0.51	0.45		
F	6.92	9.80***		
DW	2.49	2.43		

**Notes :** † statistics are in parenthesis.

\*\*\* indicates significant the 1 % level, \*\* indicates significance at the 5 % level and \* indicates significance at the 10% level.

In equation (3), we investigate the relationship between the GNP growth rate and debt burden with gross domestic investment, labour and DUM1973 (oil crisis) for the period of 1958-1996. The main investigated relationship is GNP and debt burden. All variables are taken as first differences. The debt burden is taken as the sum of the interest payments and repayments of external debt. The results show that the size effect of debt burden including external debt interest payments and repayments is significant and negative. It means that a large amount of the foreign exchange will be needed to pay the debt therefore a spectacular amount of resources goes to the foreign creditors and diverting foreign exchange from domestic country, reducing output. We expect that debt burden has negative and significant effect in the GNP. Since when countries used new loans to pay old loan commitments and when the world declared their debt crisis, it is clear that debt turned into an overhang effect. As a result, debt burden is hypothesized as a negative association with national productivity (Afxentoiu and Serletis, 1996). Estimates of the coefficient of externality in (3) are negative and statically significant at 5 % level. Hence, it is fair to conclude that the eternity effect of the government (debt burden) on the rest of the economy is negative. On the other hand, the size effect of the government (debt burden) is also negative and significant at 10 % level. Since the factor productivity differential and the externality is likely to have the same sign and both of them are negative. It is also clear that the factor productivity in non-government is higher than the government sector. However, we found the factor productivity differential between government sector and non-government sector (-0,96).

It is obvious that gross domestic investment is positive and significant. This result is also expected since Turkey has a lack of resources to increase its output. The capital stock is main factor for production. Moreover, we used the employed labour force as a proxy for labour. The empirical results show that labour is significant at 5 % level. We expect that labour gives us a significant positive effect, but not too much strong, because of the structural change in Turkish economy. Cunningham (1993) indicates that when a nation has a substantial debt burden, the manner in which labour and capital will be exploited in the production function process is bound to be influenced by the need to service that debt. More specifically, if foreign creditors rather than domestic agents benefit from the rise in productivity, the latter are discouraged from increasing capital or labour.

Table 3 represents the preliminary result from time series analysis for the 1981 - 1996. The estimates are gives for equations (3) and (4). We test the effect of the debt burden on the Turkish economy regard to structural change of the Turkish economy and debt overhang of the world economy. Since Turkey performed a new strategy, from import-substitution to outward-oriented economy. It is very important to exam-

ine 1981-1996 sub period. There are substantial rescheduling took place between 1977 and 1982 in Turkey. For this period, the dept overhang affected some indebted countries' economic growth. Because severely indebted developing countries used their foreign loans improperly, they faced debt service difficulties when they were required to pay their debt obligations. In this period, developing countries failed to meet their debt payments, as they had both resource wasting and failure to improve their foreign exchange earnings. As a result, they asked for debt forgiveness and re-scheduling. Our results from Table (3) relates to the period from 1981-1996 showed an increased importance of debt burden effect on the GNP.

**Table 3** : Dependent Variable: GNP Growth Rate Sample Period: 1981-1996  
Number of Observations: 16

Variables	Equation (3)		Equation (4)	
	Coefficients	T-values	Coefficients	T-values
Constant	-0.0041	-0.450	-0.0063521	-0.516
$\Delta L$	0.8169	1.698	1.3850**	2.326
$\Delta I/Y$	1.4949***	3.670	1.9986***	3.994
$\Delta G/Y$	-2.3952***	3.206		
$\Delta G_{-1}$	-0.0397***	-3.267	-0.028534*	-1.837
$\delta$	-0.82			
Test Results				
R <sup>2</sup>	0.81	0.63		
F	11.94***	7.05***		
DW	2.39	2.07		

**Notes** : † statistics are in parenthesis.

\*\*\* indicates significance at the 1% level

\*\*indicates significance at the 5% level

\*indicates significance at the 10% level

Our empirical results show that both the size effect and externality effect are negative and significant at the level of 1 %. On the other hand, the factor productivity differential is lower than the period of the (1958-1996), because of the 1980 outward-oriented trade strategy. We also calculated the factor productivity differential

for the period of the 1981-1996, which is ( $\delta = -0.82$ ). On the other hand, our empirical results from equation (4) show that labour rate is insignificant at any level it may be, because of the change in the structure of Turkish economy. Since the Turkish economy has transformed from non competitive economy to competitive economy. The share of capital should have much more than the share of the labour in the production. We also expected the effect of labour positive but not too much strong. Actually, this is expected in general. On the other hand, Sezgin (1997) indicates that because of the long period high inflation, we do not have exact deflators for Turkey. Thus,  $R^2$  is not enough high.

## 6. Concluding Remarks

This paper extended the Feder model to investigate the relationship between debt burden including interest payments and repayments of external debt and GNP in Turkey for the 1958-1996 period and 1981-1996. It is arguing that the country benefits partially from an increase in output or exports because a fraction of the increase is used to service the debt and accrues to the creditors. Thus, from the perspective of the debtor country as a whole, the government has little incentive to instigate policies to promote domestic capital formation or to reduce current consumption in exchange for higher future economic growth when the benefits from such policies go to creditors in the form of higher debt payments. The empirical results show that there are substantial differences factor productivities between the government sector and the non government sector. When we calculate the factor productivity differential between government and non government sector for the period of 1958-1996, which is ( $\delta = -0.96$ ). Productivities for the period of 1958-1996 for the government sector and non- government sector are ( $\delta = 0.82$ ). This is lower than the period of 1958 –1996. This result may arise from the structural changes in Turkish economy in 1980s. The empirical results show that debt burden has negative effect in the Turkey's GNP growth rate.

### **Kamu Sektörü ve Kamu Dışı Sektörde Dışsallık: Feder Modeli Yaklaşımı**

**Özet:** Bu makalede Feder modeli kullanılarak Türkiye'de dış borçlar ile ekonomik büyüme arasındaki ilişkiyi 1958-1996 ve 1981-1996 dönemleri için araştırılmaktadır. Bu amaçla Feder (1982) tarafından geliştirilen iki sektörlü üretim fonksiyonu kullanılmaktadır. Elde edilen sonuçlar kamu sektörü ile kamu dışı sektörü arasında faktör verimliliklerinin farklı olduğunu göstermektedir. Yapılan hesaplamalar sonucunda, 1958-1996 dönemine ait faktör verimliliğinin (-0.96), 1981-1996 dönemine göre daha düşük olduğunu söyleyebiliriz.

**Anahtar Kelimeler:** Dış Borçlar, Türkiye ve Dışsallık

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