EFFICIENCY OF PUBLIC EXPENDITURES IN TURKEY: WHEN DIRECT TRANSFERS REALLY CONTRIBUTE TO CITIZENS' WELFARE?

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Efficiency of public expenditures in Turkey: when direct transfers really contribute to citizens' welfare?*

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Abstract

This paper uses a general equilibrium model of a small open economy to explore the implications of different public expenditure policies. We allow for three types of public expenditures, government can invest in public capital stock thereby making production enhancing public expenditures, make utility or welfare enhancing public expenditures through supply of public services and direct transfers to consumers. In this context, our main concern will be to analyse the optimality of government's choice among these alternatives regarding the tradeoff between growth and welfare, for a given level of fiscal burden as well as the tradeoff between tax weight and growth in one hand and welfare on the other hand.

1 Introduction

Fiscal policy is one of the most important indicators of how social and economic problems are conceived by politicians. Fiscal policies affect directly and indirectly growth and income distribution while changing economic and social equilibria. In this context, the way fiscal policies are brought to public agenda and policy discussions concern the whole population. It is empirically suggested that politicians are more likely to be re-elected when the economy is growing and when enacted policies have a positive impact on welfare of voters. Thus, politicians often have difficulties to determine a sound fiscal policy free of election

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concerns and voters expectations. It's always possible to please voters through an immediate welfare impact by increasing public services or decreasing tax weight in the short term but it's necessary to face a more complicated calculation if the welfare in the long run is of concern. Under these circumstances, the design of an optimal fiscal policy to correct welfare fluctuations due to changes in growth, employment, inflation and income distribution in the most efficient way, has been debated on both political arena and academical environment.

Empirical investigations and theoretical studies have been conducted to determine growth and welfare effects of public expenditures. The studies revealed that government activity may interfere in private decision making in two ways: first by provision of public investment, i.e. infrastructure, which affects the productivity of private factors of production (Ashauer (1989), Easterly and Rebelo (1993), Miller and Tsoukis (2001)) and second, by public expenditures on goods and services that provide direct utility (Ashauer (1985), Barro (1990)). Considering the difference of their targets and impacts, the composition of public expenditures is of outmost importance. Barro (1990) questions the determinants of optimal shares of public spending and investment in an endogenous growth model and shows that a distribution of public expenditures favouring public investment enhances growth. Another focus has been the optimality of fiscal structure, in other words, the simultaneous determination of optimal tax and expenditure rates i.e. Turnovsky (1996), since the interdependence between tax collection and the allocation of public resources is crucial in the determination of an optimal fiscal policy.

This paper addresses the effectiveness of different public policies in the context of a general equilibrium model where there is physical capital accumulation and government provides growth and welfare enhancing services as in Turnovsky (1996). Growth oriented expenditures are public investments contributing to public capital stock[1] and welfare oriented expenditures are direct transfers and free public services. The main objective of the paper is to analyse the implications of different public expenditure policies since there is a trade-off between public services and transfers creating a positive short term impact on welfare and public investment, aiming growth in the log run, and to find an optimal distribution of public expenditures from a growth and welfare perspective in Turkey. The latter is achieved through a numerical simulation of the model using Turkish data for the period 1998-2006. The paper is organised as follows: Section 1 gives a brief description of the model. Section 2 provides the calibration of the model. Section 3 gives accurate quantitative predictions of optimal tax weight that can be used for policy implementation. and then analyses the effects of changes in the composition of public spending for the current level of taxes, on welfare and growth through simulations.

[1] Public invesment accumulates as in Turnovsky (1997), Dasgupta (1999), Turnovsky (2004) while studies treating public expenditure on infrastucture as a flow exist (Barro (1990), Chang (1999), Turnovsky (2000), Rivas (2003)).

2 The model

The economy consists of three main sectors: firms, households and government. The only good produced is used as a consumption good as well as a capital good. Households who owns capital and supplies labor for production maximise utility given public services, direct transfers and their budget constraints. Government collects taxes to finance public expenditures with a balanced budget. There are three types of public expenditures: government can invest in productive capital thereby making production enhancing expenditures, provide public services enhancing welfare of economic agents and make direct transfers adding up to their revenues. Firms will use public productive capital as an input in the production process in addition to private capital and labour and maximise profit accordingly.

2.1 Households

Households are representative actual and future physical capital owners and consumers of the economy. They are identical and infinitely living consumers who maximise lifetime utility with respect to consumption c_t and leisure l_t. We suppose that the numeraire good is the consumption good and normalise its price to be unity. Consequently assets are real assets i.e. they pay out in terms of the consumption good, rather than in terms of money. Each period, time endowment is set to unity shared between leisure l_t and labor supply n_t ($n_t + l_t = 1$).

Households supply labour n_t, invest in bonds market b_t and in capital market a_t given the prices $\{r_t, w_t, p_t\}_{t=0}^{T}$ where r_t is the real interest rate, w_t is the wage rate per hour and p_t is the price of a risk-free foreign bond that pays one unit of consumption next period. As always, the transversality condition or no-Ponzi game condition holds for foreign borrowing[2]. This condition prevents households to borrow forever. The government provides public services at a level of $g_{S,t}$ enhancing the utility of consumer and there are direct transfers $g_{T,t}$ adding up to the revenue. The consumer faces the following maximisation problem for a given level of initial investment in capital market a_0 and in bond market b_0:

$$\underset{\{c_t,l_t\}_{t=0}^{T}}{Max} \; E_0 \sum_{t=0}^{T} \beta^t U(c_t, l_t, g_{S,t}) \tag{1}$$

$$\begin{aligned} \text{s.t. } c_t + a_{t+1} + p_t b_{t+1} &= (1 + r_t)a_t + w_t n_t + b_t + g_{T,t} \\ c_t &\geq 0,\ l_t \geq 0,\ a_{T+1} = 0 \end{aligned}$$

The instantaneous utility is supposed to take the following form: $U(c_t, l_t, g_{S,t}) = \frac{\left(c_t^{1-\gamma} l_t^{\gamma}\right)^{1-\sigma}}{1-\sigma} + \chi \ln g_{S,t}$. The parameter χ measures the impact of public services on the instantaneous utility of consumer where publicly-provided services affect

[2] $\lim_{t\to\infty} \frac{b_t}{(1+r)^t} = 0$.

the household's utility directly. However, we suppose that private consumption and public services are additively separable[3]. The value of χ can be either positive or negative according to the substitutability or complementarity between public and private goods and services i.e. positive if public goods substitute private goods and negative if they are complementary. We suppose that both private consumption and public consumption generate a positive marginal utility, so that $\chi > 0$ in line with the theoretical studies by Agenor (2007). We suppose that publicly provided goods and services are substitutes for private goods and services. Then, the first order conditions of consumer's maximisation problem are:

$$\begin{aligned} \frac{c_t^{(1-\gamma)(1-\sigma)-1} l_t^{\gamma(1-\sigma)}}{c_{t+1}^{(1-\gamma)(1-\sigma)-1} l_{t+1}^{\gamma(1-\sigma)}} &= \beta(1+r_{t+1}) \\ \frac{\gamma c_t}{(1-\gamma) l_t} &= w_t \\ p_t &= \frac{1}{(1+r_{t+1})} \end{aligned} \tag{2}$$

The first condition (Euler condition) states that the intertemporal consumption is determined by the subjectively discounted return on savings (the opportunity cost of actual consumption). The second (labour supply) condition is the equality of the marginal utility from leisure (whose opportunity cost is the wage rate) and the marginal utility from consumption in order to maximise utility. The third (bond demand) condition states that the return on bonds and private capital shall be equal.

2.2 Firms

The representative firm hires labor n_t and rents k_t at rates w_t and $(r_t + \delta_p)$ with δ_p the depreciation rate of private capital respectively to maximise its profit:

$$\begin{aligned} \underset{n_t,\ k_t}{Max}\ \pi_t &= (1-\tau) y_t - (r_t + \delta_p) k_t - w_t n_t \\ \text{s.t.}\quad y_t &= f(k_t, n_t, k_{G,t}) \text{ where } n_t,\ k_t \geq 0 \end{aligned} \tag{3}$$

Notice that the total production is taxed at a rate τ. The technology of production is Cobb-Douglas with public capital stock $k_{G,t}$ entering as a factor that enhance the level of production: $y_t = A_t k_t^{\alpha} n_t^{1-\alpha} k_{G,t}^{\phi(\theta)}$[4] where A_t is a technological shock. We suppose that the production technology has constant returns

[3] We follow the theoretical formulation in Agenor (2007) which is in line with the empirical evidence provided by Karras (1994), McGrattan et al. (1997), Chiu (2001) and Okubo (2003). For this type of formulation, the reader can also check Turnovsky (1996, 2000, 2004), Chang (1999), and Baier and Glomm (2001) as reference.

[4] Barro(1990) indicates that public productive capital should be writen separatly in the production function because most publi services can not be easily substituted by private capital.

to scale in labor and private capital and diminishing returns to scale in private capital and public productive capital such that $(\alpha + \phi(\theta) < 1)$ following a similar formulation by Barro (1990) and Turnovsky (2004). This means that equal increases in public productive capital and private capital for a given level of labor input induce a lower increase in the output. We suppose that only a certain percentage θ of total public productive capital can be effectively used as output enhancing public capital, thus *effective public capital* is noted by $k_{G,t}$:

$$k_{G,t} = \theta \tilde{k}_{G,t} \tag{4}$$

where $\tilde{k}_{G,t}$ is *gross public capital* stock following Hulten (1996). Notice also that the productivity of public capital $\phi(\theta)$ is a function of the effectiveness level θ. If the level of effectiveness is high in the economy public capital is expected to be more productive. First order conditions for optimality are:

$$w_t = A_t(1-\alpha)(1-\tau)\left(\frac{k_t}{n_t}\right)^{\alpha} k_{G,t}^{\phi(\theta)} \tag{5}$$

$$r_t + \delta_p = A_t\alpha(1-\tau)\left(\frac{k_t}{n_t}\right)^{\alpha-1} k_{G,t}^{\phi(\theta)} \tag{6}$$

These conditions indicate that the profit is maximised where the marginal productivity of factors of production equals their cost.

2.3 Government

Government taxes only output at a rate τ. The budget is supposed to be balanced such that total tax revenue equals total expenditures g. We assume that there are three types of public expenditures: productive investment g_K, public services g_S and direct transfers g_T. The following balance and distribution of expenditures should apply:

$$\begin{aligned} \tau y_t &= g_t \\ g_t &= g_{S,t} + g_{K,t} + g_{T,t} \end{aligned} \tag{7}$$

Basically, government should determine how much to spend in each category. Government expenditure can be expressed as a weighted average of productive expenditure, public services and direct transfers[5].

$$g_{i,t} = \lambda_i g_t = \lambda_i \tau y_t$$

where $i \in \{S, T, K\}$. As such, an optimal fiscal policy depends on the efficient determination of the weights attributed to different types of expenditures. These public expenditures on the other hand differ in their nature. Public productive investment accumulates whereas services and transfers are consumed totally.

[5] $\lambda_S + \lambda_T + \lambda_K = 1$

The accumulation process for public productive investment is defined by the following dynamics:

$$\tilde{k}_{G,t+1} = g_{K,t} + (1 - \delta_g)\tilde{k}_{G,t} \tag{8}$$

where $\tilde{k}_{G,t+1}$ is gross public capital stock at $t+1$ and δ_g is the depreciation rate of public capital and is different from the depreciation rate of private capital.

2.4 Markets

Domestic Asset Market. Firms' demand for capital rentals is given by k_t and household's asset holdings at the beginning of period t are denoted by a_t. The assets held by households have to equal the capital that the firm; desires to rent. Furthermore, capital is supposed to depreciate at a rate δ_p. Then, we can express next period capital stock if we take i_t as investment at period t as follows:

$$k_{t+1} = i_t + (1 - \delta_p)k_t \tag{9}$$

Labor Market. The labor market clearing condition simply states that the demand for labor by our representative firm equals the supply of labor by our representative household.

$$n_t^s = n_t^d \tag{10}$$

Goods Market. The supply of goods by firms equals its output (it is never optimal for the firm to store output if there is any cost associated with it). Demand in the goods market is given by private consumption and investment demand and government expenditure on goods and services: $c_t + i_t + g_{S,t} + g_{K,t}$. Trade balance tb_t is defined as the excess supply. Thus the market clearing in goods markets satisfies macroeconomic equilibrium equation:

$$c_t + i_t + g_{S,t} + g_{K,t} + tb_t = y_t \tag{11}$$

Foreign Bonds Market. Trade balance tb_t, the balance of payments is given by the evolution of net holdings of foreign bonds.

$$tb_t = p_t b_{t+1} - b_t \tag{12}$$

We will simply suppose that trade balance is a constant percentage of GDP such that $tb_t = \nu y_t$.

All these equilibrium conditions hold for all periods t. The equilibrium in all these markets is attained through the adjustment of prices. The general equilibrium for this economy can be redefined in a more compact way as follows:

Definition Given prices $\{r_t, w_t, p_t\}_{t=0}^{T}$ and initial private and public capital stock $k_0 > 0$ and $k_{G,0} > 0$ and initial asset levels $a_0 > 0$ and b_0 a competitive general equilibrium (CGE) for this economy is such that the allocation rules $\{c_t, l_t, b_{t+1}, a_{t+1}\}_{t=0}^{T}$ solve households' optimization problem, the allocation rules $\{n_t, k_t\}_{t=0}^{T}$ solve firms' optimization problem, the allocation

rule $\left\{g_t, \tilde{k}_{G,t}\right\}_{t=0}^{T}$ for government balances budget and asset markets clear; then all markets clear.

At this point we can analyse the steady state of the economy which is a competitive equilibrium where all the variables are constant over time.

Definition Let $(c^*, n^*, b^*, k^*, k_G^*)$ denote the steady state consumption, employment and foreign bond holdings level and private and public capital stock. Then, if the economy starts with the steady state capital stock $k_0 = k^*$, $k_{G,0} = k_G^*$ and $b_0 = b^*$ it never leaves that steady state. And even if it starts at some $k_0 \neq k^*$, $k_{G,0} \neq k_G^*$ and $b_0 \neq b^*$; it may over time approach the steady state (and once it hits it, of course it never leaves again).

To have insights about the effects of different policy recommendations, we are carrying out numerical analysis of the model in steady state. We consider a specific time period and suppose that Turkish economy is at steady state for this period. Starting from such an equilibrium, we calculate numerically new equilibria that the economy may attain with different tax and expenditure policies. We begin by characterising the benchmark and calibrating the model using parameters representative of Turkish economy. Then, the effects of different fiscal policies on growth, welfare and employment are calculated. The following section describes the calibration of the model.

3 Calibration

The parameter calibration for the model is as follows. The reference period is take to be 1998-2006 for actuality and accuracy concerns. Table 1 shows characteristic ratios of the benchmark economy.

1. *Consumer*: The leisure share is calibrated to match the labor force participation rate (LFPR). For an average LFPR of 0.50[6], γ is calibrated as 0.36. The coefficient of risk aversion σ is set equal to 2.33 in line with empirical estimates[7]. Utility enhancing public services have been included in the instantaneous utility function in an additive manner with a coefficient χ[8]. There is no available estimation for Turkish case. As previously

[6] LFPR statiscs are taken from TURKSTAT, Household Labour Force Survey.

[7] See Kaplow (2005) for a discussion on the value of the coefficent of risk aversion.

[8] Bailey (1971) propose that public goods and services are valued as much as private goods and services and there is substituability relationship. Barro (1981) analyses the effects of government spending by incorporating this substitutability assumption. Empirical estimates by Kormendi (1983) and Aschauer (1985) for the United States and Ahmed (1986) for the United Kingdom support the substitutability argument. Aiyagari et al. (1992) and Baxter and King (1993) show that increases in government expenditure leads to decreases in private consumption, thereby suggesting substitution between public and private consumption. Chiu (2001) finds that the intratemporal elasticity of substitution is equal to 1.1 between public and private consumption. Karras (1994) investigates the relationship between private and

mentioned, the current study supposes that there is substitutability between public and private goods, there by χ is positive. Ashauer (1985) investigates the marginal substitution rate for a composite good $(c + \alpha k)$ of public and private goods and this rate which is equal to α is estimated to be between 0.23 and 0.42. This parameter reflects the sensitivity of the welfare to the provision of public goods and services and in the referred study it is estimated for a broad definition of public goods and services. Here, as we consider a much narrow definition, we will take the lower bound and choose $\chi = 0.2$. However, this parameter determines the level of welfare and as such reflects an average value in the model where the consumer is representative. Since preferences are heterogenous and each consumer is affected in different ways from the provision of public goods and services, and especially as we analyse the welfare effects of public expenditures, the results will be sensitive to the choice of this parameter. In the policy analysis section, we take into account such particularity and make sensitivity analysis accordingly.

2. *Intertemporal valuation*: Small open economy hypothesis implies that real interest rate prevailing in domestic market is determined by world level of real interest which is around 4%. However we have to account for a risk factor prevailing for Turkish economy and increase the real interest rate to the level of 10% as in Yeldan and Voyvoda (2006). Note also that real interest on treasury bonds varied for the last three years between 7% and 12%. The implied value of discount factor β is then 0.909.

3. *Producer*: The calibration of the production function involves the determination of the parameters of the Cobb-Douglas technology and the level of the impact of public capital stock. According to the estimation of Saygılı et al. (2001) the productivity of capital is approximately 0.5. The impact of public productive spending ϕ is set 0.10 based on estimations of Hulten (1996) for 42 developing countries. Total factor productivity A is set to 1 considering the negative impact of 1999 and 2001 crises and the average growth rate of 4.1% for the period under consideration.

4. *Capital dynamics*: The depreciation rate of private and public capital (δ_p and δ_g) are calculated to be 0.069 and 0.1 per year based on capital estimates provided by Saygılı et al. (2005)[9]. The steady state depreciation

public consumption through evidence from a number of countries and concludes that private and government consumption are best described as complementary (or unrelated) goods while substitutability seems to be the exception and not the rule for their sample.

[9]The capital estimates are provided up to 2003. The remaining private and public capital stock values for 2004-2006 are estimated using the ratio of public and private investment to GDP, since at steady state the percentage change in investment is equal to the percentage change in capital ($i = \delta k$). This data is available on sectoral basis for investment and capital stock. Energy, education, transportation and health sectors are mostly dominated by public enterprises and accordingly we consider the investment and capital stock in these categories as public investment and public capital stock respectively. The data in remaining categories are taken to be private investment and capital stock.

rate for public and private capital is then given by investment capital ratio. The efficiency of public expenditures[10] is calculated given the assumption that public expenditures i.e. investments in different fields are adding-up during time. As public productive capital stock includes different categories (three categories: productive expenditures, education and health) with different characteristics, we have to calculate a weighted efficiency index or an average level of efficiency. The weights of respective categories are taken as the shares of respective fields in total public capital stock (83,5%, 9.3% and 7%) to reflect the relative importance of each category in overall performance. Public capital efficiency index is then calculated as a weighted average of the individual index[11] of each category as 0.788.

5. *Government*: Government expenditures can be decomposed into three categories according to their targets: public productive expenditures (health, education, economic affairs and services, general government services), public services (defense, public order and safety, environment protection, recreation[12] and housing and community amenities) and direct transfers (transfers via social security institutions)[13]. The respective shares of these categories within the budget are calculated from EU Pre-Accession Economic Programme (2007) of Turkish government. λ_S is 0.28 and λ_T is 0.27 for public services and direct transfers respectively. The remaining share λ_K represents productive expenditures. For the reference period, the share of government expenditures in GDP is 21.7%, as we suppose government budget is balanced and government taxes revenue to finance these expenditures at a rate τ, the tax rate is 0.217[14].

[10] See Hulten (1996), Fisher et al. (1998) and World Bank Development Report 1994 for basic ideas on public capital efficiency.

[11] Individual indices of each category are calculated in the following ways.

Infrastructure: The efficiency of public productive expenditures is calculated as in Machicado (2007). First, a weighted loss index is calculated for public infrastructure using loss indicators data in World Development Report 1994 and weights proposed by World Bank for developing countries. Then the relative effectiveness has to be calculated compared with industrialised countries efficiency. The result is 0.755. Table 2 summarises data and calculation procedure.

Education: As far as education expenditures are concerned World Bank (2006) indicates that Turkish performance is below an average level of performance. The efficiency is calculated taking into account this inefficiency of 0.04 therefore we find an efficiency level of 0.96.

Health: First we have to find an estimate for the efficiency of health expenditures and then we calculate Turkish efficiency according to this level. We use World Bank (2006) providing with private and public health expenditures and health indicators. We calculated an index using health indicators where equal weight is given to each of these indicators. Then we estimated the regression between health index and public health expenditures. Turkey performs 4.52% under an estimated level of performance according to this estimation. The efficiency level is then 0.9548.

[12] We did not included interest payments in this type of expenditure.

[13] An econometric study on the impact of different types of expenditures on growth in Turkey is provided by Bakis et al. (2008).

[14] The calculation procedure is as follows: Given the distribution of different categories of expenditure, we suppose that the share of out-of-transfers expenditures can be deduced from GDP. Accordingly, the share in GDP of total government expenditures plus public investments are calculated to be 15,9% for 2006. From EU Pre-Accession Economic Programme (2007) of

6. *Trade balance*: Trade balance is calculated as a percentage of GDP for the period 1998-2006. We found a value of -0.01 for ν[15].

Table 1 Benchmark economy			
Ratio	Description	Range-Average	Model
$\frac{TB}{Y}$	Trade deficit/GDP	[-0.049,0.041] -0.009	
$\frac{C}{Y}$	Private consumption/GDP	[0.665,0.717] 0.696	0.691
$\frac{I}{Y}$	Private investment/GDP	[0.117,0.189] 0.156	0.159
$\frac{K}{Y}$	Private capital/GDP	[2.004,2.778] 2.278	2.320
$\frac{K_G}{Y}$	Public capital/GDP	[0.823,0.999] 1.000	0.976
$\frac{G}{Y}$	Public expenditures/GDP	[0.203,0.234] 0.217	
n	Labour force participation rate	[0.480,0.537] 0.504	0.502

Table 2 Infrastructure efficiency index						
	Power	Telecom	Roads	Water	Absolute	Relative
Turkey	17.8	1	55.35	44		
Weights	0.40	0.10	0.25	0.25		
Weighted Loss	7.12	0.10	13.84	11	67.94	75.53
Ind. Countries	7	13	15	8		
Weights	0.50	0.09	0.30	0.11		
Weighted Loss	3.5	1.7	4.5	0.88	89.95	100

3.1 Simulations

In what follows we present different scenarios and the simulations conducted to evaluate these scenarios are associated with their figures.

Scenario 1: Given the actual distribution of public expenditures what is the optimal size of fiscal burden? (Figure 1.1).

The purpose of the first scenario is to determine the optimal tax weight for the benchmark economy. Since we suppose that the public budget is balanced and total expenditures are equal to total tax revenue the ratio of public expenditures to GDP represents tax weight. The scenario consists in increasing tax weight and calculating the impact on principle economic indicators. The computation of steady state values of production, consumption and welfare points out to three important tax rate: 18%, 15% and 11%. If we consider employment rate, such an increase is matched with a continuous decrease in employment. The emergence of different tax rates maximising growth and welfare is interesting. A closer look at the results will clarify this difference. There are three

Turkish government, we know that these fields constitute 73% of the budget which induces a share of 5.9% of GDP for direct transfers. For 2006, the government budget accounts for 21.8% of the GDP. The same weights are then used to interpolate data between 1996-2006. The average tax burden reveals then as 21.74%.

[15] For water and energy provision, the percentage of system losses on total production are considered. For telecomunation infrasructure, the number of faults by 100 mainlies by year and for the transportation infrastructure the percentage of paved roads are considered.

The fields for power and roads have been updated by World Bank ECA database for 2005 and 2003 respectively. ECA Database last available 2005 for power and 2003 for roads.

effects of an increase in tax rate on production: first the increase in public capital and private capital productivity through increased public investment, second the decrease in production due to the decrease of labour supply as incomes of households are increased through transfers and third after a certain level of tax weight, the increased tax burden decreases the level of savings and thus production. The shape of the production curve reflects the positive effect of public investment up to the level of 15% and this level indicates the point after which the negative impacts will outweigh positive impacts.

If we analyse the impact on welfare, in the interval where welfare increases private consumption first increases and then decreases. Welfare depends on three factors: private consumption, leisure and public services. The increase in private consumption resulting from the increase in production will definitely increase welfare. However in the interval where production and private consumption are decreasing, welfare continues to increase. The reason is that the decrease in welfare due to lower private consumption is compensated by the increase in the provision of public services. The critical tax rate 18% shows that public policies can be designed to improve welfare despite an increase tax burden.

Result 1 We can see that public policies can be used as a means to reduce income inequalities and consequently welfare differences. For this scenario, the positive impact of public investment through an increased tax revenue lasts for a shorter interval than the welfare impact of public services, since the increased tax burden will weigh on income after a certain level. For the benchmark economy, the latter is 15% after which an increase in tax rate does not have a positive effect on production. Thus, when the tax weight has to be increased the production level may only increase through increased efficiency of public capital. Another remark is that, the increase in tax rate induce a higher impact on welfare than private consumption and production in the interval where all increase while it will induce a lower impact in the interval where all decrease. To sum up, in the Turkish case the appearance of a tax rate of 22% may be explained by welfare oriented policies, since this current level is above the optimal tax level maximising growth and welfare (note that this is the ratio of public expenditures to GDP).

Result 2 The sensitivity of the results to the welfare parameter χ is given in Figure1.2. For low levels of χ, the welfare reaches its maximum at lower tax rates. As the value of χ rises, we can observe that the maximum welfare levels are coupled with higher tax rates. These results can be explained as follows: as χ indicates how much an individual benefit from public services, we see that high level of taxes can become acceptable if χ is increased, in other words, the individual benefits more and more from public services. If public services become more accessible, the fairness of high levels of tax burden can be rationalised. In that sense, the welfare impact of public services, measuring the accessibility and the efficiency of

those, is crucial in the perception of the tax burden as fair and acceptable by the tax payers.

Now that we have determined an optimal level of tax rate we have to look if at the prevailing tax level there is an optimal distribution of expenditures. Since we have a given level of fiscal revenue, if we increase any type of government expenditure this will automatically decrease the other expenditures and this in turn requires a policy choice. Thus the question is to determine the trade-off between these. In the model as public expenditures affect production and welfare at the same time, any change in the distribution of public expenditures will imply a trade-off between growth and welfare.

Scenario 2: Given tax rate and the share of utility enhancing public expenditures, what is the trade-off between productive expenditures and transfers? (Figure 2)

The first exercise is to determine the trade-off between transfers and public investment. The production obviously suffers from an increase in transfers out of public investment budget, but strikingly enough welfare too even though the negative effect on welfare is less than the effect on production. The reason behind this pattern is that the change in consumption is due to the change in production and transfers and obviously the first dominates the second.

Result 3 Given the share of services, government can only decrease the level of transfers and increase public investment to improve both growth and welfare; since public investment which has a positive impact on income trough increased production seems more efficient than using direct transfers.

Scenario 3: Given tax rate and the share of public investment what is the trade-off between transfers and utility enhancing expenditures? (Figure 3.1)

We have seen that backing transfers from public investment worsens economic growth and welfare. Now given the share of public productive expenditures, the question is the trade-off between transfers and services. This trade-off is crucial as transfers and services both affect welfare; and consequently their relative importance in consumer welfare will affect any choice between these two expenditures. The first increases welfare through increased income and consumption, and the second directly increases welfare trough the provision of public services. We must take into account that such an exercise has an indirect effect on production through the change in labour supply.

We can not boost production from demand side by increased transfers or services, as their overall level does not change. Making transfers instead of providing public services has a positive impact on private consumption. On the other hand, production and welfare suffer from this choice, since the positive income effect of transfers generates a lower labour supply; thus a decay in production. But the fact that welfare continuously decreases shows that the impact of public services on welfare is higher than that of transfers.

Result 4 The increase in transfers boosts consumption and welfare, but only up to a certain interval $(0.02 - 0.05)$ which is far behind than the actual

share of transfers (0.27). The sensitivity analysis for χ can inform us about the emergence of such a high share of transfer. In the benchmark economy, the average impact of public services is taken to be $\chi = 0.2$ but we can not say that all segments in the population benefit at the same rate from public services. One of the reasons may be the differences in accessibility to public services[16]. In fact χ homogenises such a differentiation and expresses an average impact level. When we repeat the simulation taking into account the differentiation, the results in Figure 3.2 clearly show that for low levels of χ, high ratios of transfers maximise welfare. In other words, as χ,the rate at which the individuals benefit from public services decreases, transfers become more and more important compared with public services. *These results indicate that transfer policies aiming segments of population having low access to public services or having access to public services with low efficiency can be beneficial*[17].

Scenario 4: Given tax rate and the share of transfers what is the trade-off between production and utility enhancing expenditures? (Figure 4)

The fourth exercise is for the comparison of production and utility enhancing expenditures since the first favors consumer and the second firm. This scenario where the direct welfare impact is made through public services and the indirect welfare impact arises from production and consequently income, is obviously crucial. Such a policy choice has no effect on employment. Since the increase in public services will be financed out of public investment, production thus consumption will be negatively affected. The negative welfare impact caused by the decrease in production, thus consumption, is compensated with the increase in the provision of public services but only up to a certain level (0.28). Above 0.28, the welfare improving effect will no longer last since the effect of the change in services on utility is dominated by the effect of the change in consumption.

Result 5 The ratio of public services maximising welfare is strikingly 0.28 which is nearly equal to the current ratio of public services in the budget. This is a critical threshold at which increasing the share of public services will negatively affect both growth and welfare. In this case, a welfare and growth improvement is only possible if the accessibility, the quality and the efficiency of public services is improved.

Result 6 At the steady state the employment level is calculated as $n^* = \frac{a}{1+\frac{\lambda_T \tau - \nu}{(1-\tau)}+b}$[18]. Scenario 1 is characterised by the continuous decrease of labour supply ($\frac{\partial n}{\partial \lambda_T} < 0$). Scenarios 2 and 3 are conducted by increasing

[16] Karanfil and Polat (2008) shows that accessibility and efficiency differences exist using regional indices.

[17] The simulations conducted with $\chi = 0.05$, 0.10,0.15 show that by 0.15 the welfare curve is constantly decreasing. In this case we did not find necessary to compute welfare values for $\chi > 0.15$.

[18] $a = \frac{(1-\gamma)(1-\alpha)}{\gamma}$ and $b = \frac{(1-\gamma)(1-\alpha)}{\gamma} - \frac{\alpha \delta_p}{r+\delta_p}$. Note that the employment level is fuction f all policy parameters.

the level of λ_T and are characterised by the continous decrease of labour supply ($\frac{\partial n}{\partial \lambda_T} < 0$). In Scenario 4 the employement level is constant since λ_T is constant. Any policy considering a higher level of transfers must take into account the possible negative impact on employment.

4 Concluding remarks and discussion

Different distributions of public expenditures studied under four scenarios point out to the importance of differences among individuals to access to and benefit from public services. Figure 1.2 shows that the accessibility of public services or their quality and efficiency are crucial in the determination of an acceptable tax burden (the segment of the population having a greater access to public services or having access to more efficient public services, will be more willing to accept an increased tax weight). In this sense, the social reactions which may arise as a result of increased tax burden may be lessened by improving the accessibility, quality and efficiency of public services. On the other hand, in cases where no such improvement is probable and doable, as Figure 3.2 emphasises, there is a need to use welfare improving transfers.

The second important implication of the simulations underlines the need to take into account the role of the efficiency of public investment as a strategic parameter in the implementation of fiscal policies. Given the difficulties encountered in the determination of the level and composition of public expenditures, the improvement of the efficiency of public capital will provide some flexibility. This dimension frequently elaborated in the theoretical discussions is generally neglected in the agenda of politicians in policy discussions. Remember that the contribution public capital to production increases with the efficiency; consequently the efficiency is a crucial element in both growth and welfare frameworks and appears to be a key parameter in the dilemma brought about with the determination of the fiscal burden where politicians have to compromise from growth to improve welfare. In all the scenarios, it is possible to show the welfare and growth improvements achieved with higher levels of public capital efficiency. However, the trade-off between public services and investment (the scenario 4) is especially worth analysing. In the context of this scenario, the efficiency has two impacts: first, an increase in all levels for the same composition of expenditures, second a welfare maximisation at a lower share of public services. The latter is useful in focusing on growth without compromising from welfare. Figure 5 shows welfare and growth effects of efficiency. We see that at a higher level of efficiency leads to higher levels of production and consumption, meanwhile welfare is maximised at a lower share of public services. As a result, when we consider the welfare impact of policies favoring the improvement of efficiency of public productive capital, the fine tuning of the share of public services in the budget seems necessary in the efficient use of all public resources.

A Appendix

In all figures Y (Y –), C (C - -), W and n indicate the levels of production, consumption, utility; dY (dY –), dC (dC - -) and dW (dW ..) indicate the change in production, consumption and utility.

Figure 1.1 $\tau \in [0, 0.3]$ $(\lambda_S, \lambda_T, \lambda_K) = (0.28, 0.27, 0.45)$

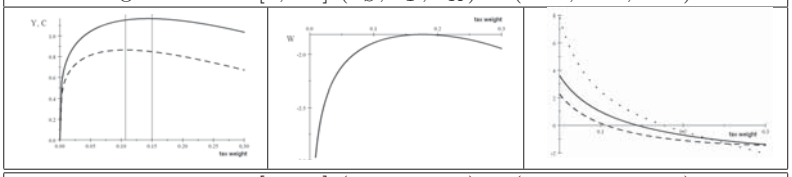


Figure 1.2 $\tau \in [0, 0.3]$ $(\lambda_S, \lambda_T, \lambda_K) = (0.28, 0.27, 0.45)$

$\chi = 0.1$	$\chi = 0.2$	$\chi = 0.3$

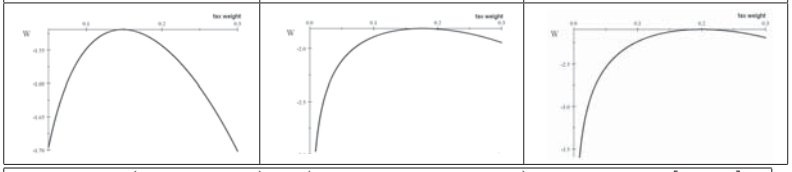


Figure 2 $(\lambda_S, \lambda_T, \lambda_K) = (0.28, \lambda_T, 0.72 - \lambda_T)$ where $\lambda_T \in [0, 0.3]$

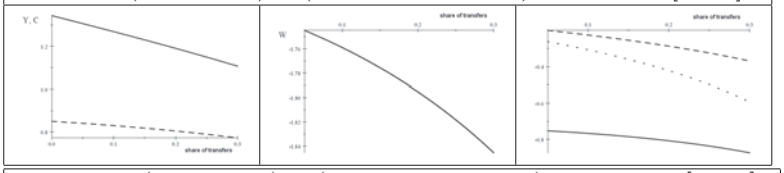


Figure 3.1 $(\lambda_S, \lambda_T, \lambda_K) = (0.55 - \lambda_T, \lambda_T, 0.45)$ where $\lambda_T \in [0, 0.3]$

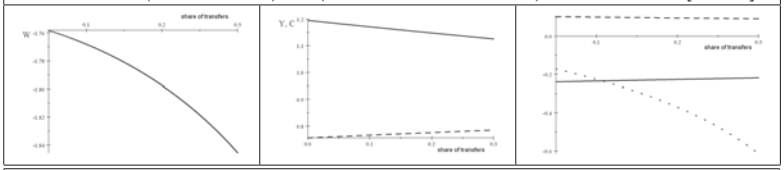


Figure 3.2 $(\lambda_S, \lambda_T, \lambda_K) = (0.55 - \lambda_T, \lambda_T, 0.45)$ where $\lambda_T \in [0, 0.3]$

$\chi = 0.05$	$\chi = 0.1$	$\chi = 0.15$

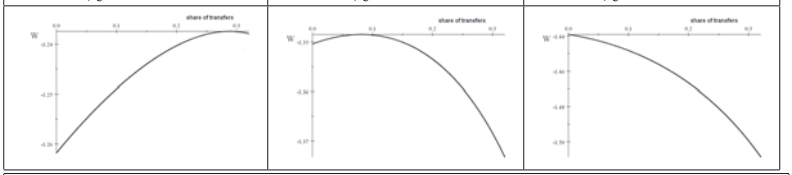


Figure 4 $(\lambda_S, \lambda_T, \lambda_K) = (\lambda_S, 0.27, 0.73 - \lambda_S)$ where $\lambda_S \in [0, 0.4]$

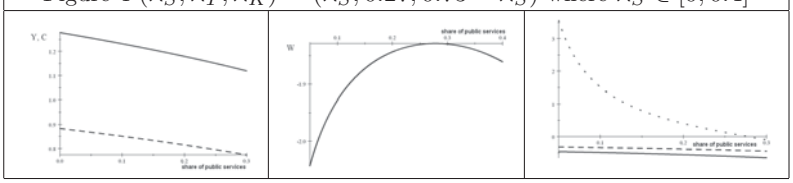
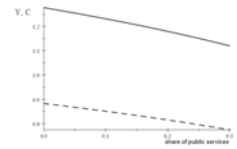
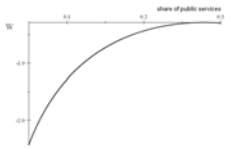
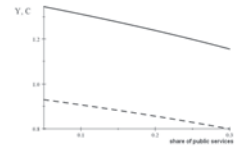
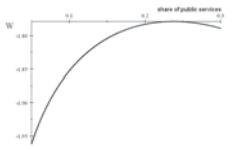


Figure 5

$\theta = 0.79 \quad \phi = 0.1$	$\theta = 0.79 \quad \phi = 0.1$
	
$\theta = 0.9 \quad \phi = 0.125$	$\theta = 0.9 \quad \phi = 0.125$
	

Aiyagari, S., Christiano, L.J. and M. Eichenbaum (1992) The output, employment, and interest rate effects of government consumption, Journal of Monetary Economics, 30, 73-86.

Agenor, P.-R. (2007) Fiscal policy and endogenous growth with public infrastructure, Oxford Economic Papers.

Ahmed, S. (1986) Temporary and permanent government spending in an open economy, Journal of Monetary Economics, 17, 197-224.

Ashauer, D. (1985) Fiscal Policy and Aggregate Demand, American Economic Review, 75, 117-27.

Ashauer, D. (1989) Is public expenditure productive?, Journal of Monetary Economics, 23, 177-200.

Baier, S.L. and Glomm, G. (2001) Long-run growth and welfare effects of public policies with distortionary taxation, Journal of Economic Dynamics and Control, 25, 1007-42.

Bailey, M. (1971) National Income and the Price Level, McGraw-Hill.

Bakis, A., Jobert, T., Tuncer, R. (2008) Kamu harcamaları ve büyüme, zaman serileri analizi, Türkiye'de kamu harcamaları: Avrupa Birliği ile karşılaştırma, bölgesel dağılım, büyüme ve refaha katkıları. Açık Toplum Enstitüsü-BETAM.

Barro, R.J. (1990) Government spending in a simple model of endogenous growth, Journal of Political Economy, 98, s103-25.

Baxter, M. and King, R. (1993) Fiscal policy in general equilibrium, American Economic Review, 83, 315-334.

Chang, W.-Y. (1999) Government spending, endogenous labor, and capital accumulation, Journal of Economic Dynamics and Control, 23, 1225-42.

Chiu, R.-L. (2001) The intratemporal substitution between government spending and private consumption: empirical evidence from Taiwan, Asian Economic Journal, 15, 313-24.

Dasgupta, D. (1999) Growth versus welfare in a model of nonrival infrastructure, Journal of Development Economics, 58, 359–85.

Easterly, W. and Rebelo, S. (1993) Fiscal policy and economic growth, Journal of Monetary Economics, 32, 417–58.

Fisher, W.H. and Turnovsky, S.J. (1995) Composition of government expenditure and its consequences for macroeconomic performance, Journal of Economic Dynamics and Control, 19, 747–86.

Hulten, C. R. (1996) Infrastructure capital and economic growth: How well you use it may be more important than how much you have, (5847). NBER Working Paper.

Kaplow, L. (2005) The value of a statistical life and the coefficient of relative risk aversion, Journal of Risk and Uncertainty, 31, 23-34.

Karanfil, F., Polat, S. (2008) Temel kamu hizmetlerinin il bazında analizi: sağlık ve eğitim, Türkiye'de kamu harcamaları: Avrupa Birliği ile karşılaştırma, bölgesel dağılım, büyüme ve refaha katkıları. Açık Toplum Enstitüsü-BETAM.

Karras, G. (1994) Government spending and private consumption: some international evidence, Journal of Money, Credit, and Banking, 26, 9–22.

Kormendi, R.C. (1983) Government Debt, Government Spending, and Private Sector Behavior, American Economic Review, 73, 994-1010.

Machicado, C.G. (2007) Macroeconomic and welfare effects of public infrastructure investment in five Latin American countries, Institute for Advanced Development Studies. Development Research Working Paper Series.

McGrattan, E.R., Rogerson, R., and Wright, R. (1997) An equilibrium model of the business cycle with household production and fiscal policy, International Economic Review, 38, 267–90.

Miller, J. and Tsoukis, C. (2001) On the optimality of public capital for long-run economic growth, Applied Economics, 33, 1117–29.

Okubo, M. (2003) Intertemporal substitution between private and government consumption: the case of Japan, Economics Letters, 79, 75–81.

Rioja, F.K. (1999) Productiveness and welfare implications of public infrastructure: a dynamic two-Sector general equilibrium analysis, Journal of Development Economics, 58, 387–404.

Rivas, L.A. (2003) Income taxes, spending composition and long-run growth, European Economic Review, 47, 477–503.

Saygılı, Ş. (2005) Türkiye ekonomisinde sermaye birikimi, verimlilik ve büyüme, State Planing Organisation.

Saygılı, Ş., Cihan, C. and H. Yurtoğlu (2001) Productivity and growth in OECD countries: an assessment of the determinants productivity, Yapi Kredi Economic Review, 12, 49-66.

Turnovsky, S.J. (1996) Optimal tax, debt, and expenditure policies in a growing economy, Journal of Public Economics, 60, 21–44.

Turnovsky, S.J. (1997) Fiscal policy in a growing economy with public capital, Macroeconomic Dynamics, 1, 615–39.

Turnovsky, S.J. (2000) Fiscal policy, elastic labor supply, and endogenous growth, Journal of Monetary Economics, 45, 185–210.

Turnovsky, S.J. (2004) The transitional dynamics of fiscal policy: long-run capital accumulation and growth, Journal of Money, Credit, and Banking, 36, 883–910.

World Bank Report (1994) World Development Report, Infrastructure for development.

World Bank Report (2006) Turkey public expenditure review.