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ABSTRACT

Public Goods, Merit Goods, and the Relation Between Private and Government Consumption*

In this Paper, we investigate the relation between public and private consumption by constructing a general government spending dataset, by function, for 12 European Union countries. In particular, we split government consumption into two categories. The first category includes defence, public order, and justice ('public goods'). The second category includes health, education, and other services that could have been provided privately ('merit goods'). Equations from a relatively general theoretical model of household behaviour are estimated by Generalised Method of Moments (GMM). The estimates are fairly robust in showing that public goods substitute, while merit goods complement, private consumption, and that the relation between merit goods and private goods is stronger than that between public goods and private goods. So that, in the aggregate, government and private consumption are complements. It also suggests that the potential calibration/estimation bias by ignoring the composition of government consumption might be substantial.

JEL Classification: C33, E60 and H30
Keywords: dynamic panel estimation, government consumption, merit goods and public goods

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NON-TECHNICAL SUMMARY

In this Paper, we estimate the relationship between public and private consumption, splitting the former into two categories. The first category, that we shall call 'public goods', includes defence, public order, and justice. The second category, that we shall call 'merit goods', includes health, education, and other services that could have been provided privately.

First, we present the 'stylized facts' of functional government spending. We construct an international dataset from 1970 to 1996, made up from 12 European Union countries. The public and merit goods categories are generated by adopting a functional classification of general government spending, along the lines set forth by Saunders and Klau (1985), in their OECD study.

Second, we present a model of household behaviour in the presence of private, public, and merit goods. This model may be thought of as part of an otherwise standard neoclassical growth model. Neither the behaviour of the other agents in the economy nor the economy's equilibrium laws of motion are, however, modelled explicitly. The underlying idea is simply to derive an estimable equation that characterizes the relation between private and public goods consumption, on the one hand, and between private and merit goods consumption, on the other. An effort is made so that this characterization takes into account some potentially important features of the underlying goods, such as non-rivalness in consumption and time non-separability of the utility function. More importantly, however, we depart from the literature in that we do not employ any specific temporal utility functional form. For as we show, the specific functional forms used in this literature would imply restrictions that severely limit the nature of the relations we try to estimate.

Third, we report the estimation methodology and results. The equations from the theoretical model are estimated by Generalised Method of Moments (GMM), using the panel data mentioned above. The estimates are fairly robust in showing that public goods substitute and merit goods complement private consumption, and that the relation between merit goods and private goods is stronger than the relation between public goods and private goods. Moreover, since merit goods consumption is about two thirds of government consumption, these findings imply that in the aggregate, government and public goods are complementary. This, then, explains why in most of the early studies there was evidence of substitutability between aggregate private and public consumption while in the most recent studies there is evidence of complementarity. At any rate, this suggests that the potential calibration/estimation bias by ignoring the composition of government consumption might be quite substantial.

There are several ways we could extend our analysis. First, we could incorporate leisure into the utility function to account for the possible interaction between government consumption and leisure. Second, we could endogenize government consumption decisions, solving the corresponding Ramsey Planner problem. There is a system of equations involving private goods, public goods and merit goods consumptions that could be estimated.

Finally, previous examples on the possible reasons behind the complementarity of merit goods seem to suggest that complementarity is associated with inefficiency when it occurs *within* the same spending category (e.g. health or education), while positive externalities could explain complementarity whenever, for example, public schools or public health improve the consumption of different private goods, i.e. when the relation is *between* spending categories. Analysing government functional spending, and extending the field to this more complex case, would require wider and better data than those available, but could possibly contribute to a deeper understanding of the Welfare State effects on the EU economies**.**

1. Introduction

The response of economic aggregates to government spending changes has always been at the very heart of macroeconomics and government policy debates. It has been long recognized that this response varies across government spending categories (e.g., consumption, investment, income transfers, interest payments). In particular, the response of economic aggregates to changes in government consumption is thought to depend on the relationship between government and private consumption (Baily (1971), Hall (1980), and Barro (1981)). For example, this response will depend on whether government consumption substitutes private consumption in the sense of a public policeman reducing the need for a private policeman. Since then, a large literature has been developed that estimates this relationship (Kormendi (1983), Aschauer (1985), Reid (1985), Bean (1986), Ahmed(1986), Campbell and Mankiw (1990), Graham and Himarios (1991), Graham (1993), Karras (1994), Ni (1995), Amano and Wirjanto (1998)). However, the evidence is not conclusive. Aschauer, Kormendi, and Bean using different data sets for the United States find a small substitution effect between private and public consumption. Ahmed using a long data set for the UK also finds evidence of substitutability between private and public consumption. However, Campbell and Mankiw do not find any significant effect, in a postwar data set for the US. And, Karras finds complementarity between public and private consumption in a number of countries. The uncertainty of results is confirmed by Ni, who shows that the relationship between private and government consumption is sensitive to the choice of the utility function and the interest rate measurement. In the meantime, this relation has come to play an important role for the workings of fully articulated stochastic dynamic general equilibrium models, that form the mainstream paradigm in contemporary macroeconomics (e.g., RBC models) (Aiyagari et al. (1992), Christiano and Eichenbaum (1992), Baxter and King (1993), Correia et al. (1996), Devereux et al. (1996), and Kollintzas and Vassilatos (2000)).

In this paper, we estimate the relationship between public and private consumption, splitting the former into two categories. The first category, henceforth, “public goods,” includes defense, public order, and justice. The second category, henceforth, “merit goods,” includes health, education, and other services that could have been provided privately.

Our motivation for doing so is both theoretical and empirical. The theoretical motivation has to do with important differences in the very nature of these goods. For example, public goods are to a great extent non-rival in consumption, while merit goods are to a great extent rival in consumption and their positive externalities depend on distributional and demographic characteristics. The empirical motivation has to do with the different paths followed by these two categories of goods, due to the growth of the Welfare State, especially since the 1970s.[1]

In Section 2, we present the "stylized facts" of functional government spending. We construct an international dataset from 1970 to 1996, made up from twelve European Union countries. The data are described and explained in an appendix at the end of the paper. The public and merit goods categories are generated by adopting a functional classification of general government spending, along the lines set forth by Saunders and Klau (1985), in their OECD study.

In Section 3, we present a model of household behavior in the presence of private, public, and merit goods. This model may be thought of as part of an otherwise standard neoclassical growth model. But, neither the behavior of the other agents in the economy nor the economy's equilibrium laws of motion are modeled explicitly. The underlying idea is simply to derive an estimable equation that characterizes the relation between private and public goods consumption, on the one hand, and between private and merit goods consumption, on the other. An effort is made so that this characterization takes into account some potentially important features of the underlying goods, such as non-rivalness in consumption and time nonseparability of the utility function. More importantly, however, we depart from the literature in that we do not employ any specific temporal utility functional form. For as we show, the specific functional forms used in this literature would imply restrictions that severely limit the nature of the relations we try to estimate.

In Section 4, we report the estimation methodology and results. The equations from the theoretical model are estimated by GMM, using the panel data described in Section 2. The estimates are fairly robust in showing that public goods substitute and

[1] See Tables 2-4 of this paper.

merit goods complement private consumption. And, that the relation between merit goods and private goods is stronger than the relation between public goods and private goods. Moreover, since merit goods consumption is about two thirds of government consumption, these findings imply that in the aggregate government and public goods are complementary. This, then, explains why in most of the early studies there was evidence of substitutability between aggregate private and public consumption while in the most recent studies there is evidence of complementarity[2]. At any rate is suggests that the potential calibration/estimation bias by ignoring the composition of government consumption might be quite substantial.

In Section 5, we offer some ideas about related future research.

2. Government Spending in Europe

Since the 1970s general government spending in Europe and elsewhere has not simply increased, but has also changed in composition. Moreover, government spending to GDP ratio has not been fluctuating around some constant ratio, as implied by stabilization policies, but, instead, it has steeply increased. In most cases, this increase lasted until the early 1990s, when the EMS crisis and the EMU entering criteria brought about increased costs of debt financing and then the need of higher fiscal discipline.

The increases in government consumption size were paralleled by its changing composition. This is evident by looking at both economic and functional categories of government spending. This holds true, in general, and for the twelve European Union countries, we study in this paper. The selection of these countries - Austria, Denmark, Finland, France, Germany, Greece, Italy, Norway, Portugal, Spain, Sweden and the United Kingdom - was made on the basis of data availability alone.

Economic classification:

Comparing the main trends in Table 1, we find that:

[2] Moreover, it must be noted that the US studies typically refer to government purchases which includes also government fixed investment.

- Government consumption stopped, in most cases, of being the largest component of government spending (Alesina and Perotti, (1995)).
- Fixed investment expenditures, which is the remaining of government purchases, was remarkably reduced everywhere. This is probably a result of an effort to reduce government spending without cutting income-related spending.
- In the sample period, in most cases, transfers became, the largest spending component. In turn, the lion's share of transfers (80-90%, in most cases) consists of social security benefits.
- The interest spending share rose notably in some cases, but felt in the late 1990s.

Functional classification

Following Saunders and Klau (1995), we examine the same changes in terms of a functional classification of government spending. Thus, we look at three major categories:

A. *Traditional Domain,* which corresponds to the provision of public goods such as defense, public order, justice, etc.

B. *Welfare State Domain,* which in turn is made up by two subcategories:

i) *Merit Goods,* such as education and health services.

ii) *Income Maintenance* Programs, that include social security benefits and many other cash benefits for the eligible recipients (disability, injury, sickness, unemployment, housing benefits, etc.)

C. *Mixed Economy* interventions which mostly amount to infrastructure spending (*Economic services*) and to interest payments on the outstanding general government debt.

We compare first our data for 1985 with those provided by Saunders and Klau. Despite changes in data and accounting systems, differences are negligible. Then, we compare the spending composition in each country with that found in the last available year. This turns out to be around 1995. (See Table 4.)

Summarizing, the functional classification shows that:

- The provision of public goods is roughly a constant and a relatively small share of total government spending. This share is *always* smaller than 10% and cannot account for the spending increase found in the economic classification.
- Most of the spending increase is associate with the Welfare State components. However, the increase in the *Merit Goods,* is in general relatively small, so that the increase in *Income Maintenance* programs dominates. This evidence matches the economic classification evidence, showing the parallel reduction among government purchases and the increase in transfers and taxation. (See, e.g., Masson and Mussa (1995) and Fiorito (1997)).
- The reduction in public investment spending is often paralleled by the increased interest spending, though there are differences among countries and periods.

By looking at government consumption only (Table 2), we find that:

- The share between government and household consumption generally rises in nominal terms but *falls* in volumes. This reveals a different pattern for relative price movements. That is, government consumption deflator exceeds private consumption deflator.
- Since the estimated equation deals with volumes, it seems that the ratio between these two variables is not constant; i.e., that government consumption falls with respect to household consumption, though there are again country differences.
- When looking at government consumption only, it appears that the public good component is much smaller than the merit good component The public good component tends to fall and, ranges between one fourth and one third of the overall consumption. Greece seems to be the only exception.

- The merit good component dominates and has a positive growth trend. Education and health are the most important subcategories (Table 2) and account for about 4/5 of the merit goods aggregate.

These findings confirm the fact that the public goods category has behaved differently from the merit goods one over the last thirty years or so. So that, the composition of government spending has changed.

3. THE MODEL

We present a model of household behavior in the presence of private, public, and merit goods. This model may be thought of as part of an otherwise standard neoclassical growth model. But, neither the behavior of the other agents in the economy nor the economy's equilibrium laws of motion will be modeled explicitly. The underlying idea is, simply, to derive an estimable equation that characterizes the relationship between private and public goods consumption, on the one hand, and between private and merit goods consumption, on the other hand. An effort is made so that this characterization takes into account some potential important features of the underlying goods. For example, non-rivalness in public goods consumption, positive externalities in merit goods consumption, and time nonseparability of the utility function. More importantly, however, we do not employ any specific temporal utility functional form. For as we show, the specific functional forms used in the literature would imply restrictions that severely limit the nature of the above mentioned relationships. The severiness of these restrictions stem from the fact that we deal with three rather than two goods, as usually done in the literature. The "price to pay" is that we characterize the relation in deviations from the steady state, giving up the study of the corresponding long-run relation.

3.1 Households

We consider an economy that is populated by a large number of identical households. The number of households, N_t, evolves exogenously, according to:

$$N_{t+1} = (1+g_N)N_t, \quad N_0 \in \Re_+ \text{ given} \tag{1}$$

where $g_N \in [0,\infty)$ is the constant rate of population growth, in all periods, t. Technological progress is labor augmenting and the technology state, Z_t, evolves exogenously, according to:

$$Z_{t+1} = (1+g_Z)Z_t, \quad Z_0 \in \Re_+ \text{ given} \tag{2}$$

where $g_Z \in [0,\infty)$ is the constant rate of technological progress in all periods, t.

The representative household's preferences are characterized by the conditional expectations of a life-time utility function:

$$\mathrm{U} = \mathrm{E}_0 \sum_{t=0}^{\infty} \tilde{\beta}^t \mathrm{u}(\tilde{c}_t, \tilde{g}_t, \tilde{m}_t), \tag{3}$$

where $E_0(.)$ is the expectations operator, conditioned on information available at the beginning of period 0; $\tilde{\beta} \in (0,1)$ is a constant time-discount factor that depends, possibly, on the rates of population growth and technological progress[3]; and $u(\tilde{c}, \tilde{g}, \tilde{m})$ is a neoclassical temporal utility function in the "effective" consumption of private, $\tilde{c}_t$, public, $\tilde{g}_t$, and merit $\tilde{m}$, goods. By a neoclassical utility function we mean a real valued function that is at least twice continuously differentiable, strictly increasing, concave and strictly quasi concave in all its arguments. Effective consumption may be thought of as consumption per technologically efficient household (i.e., the ratio of aggregate consumption and the product of population and the labor augmenting technology index). This will be made explicit in the next subsection.

3.2 Time Nonseparability and Consumption Expenditures versus Consumption Services

We follow the modern consumption behavior literature and assume that consumption services are linear functions of present and past consumption expenditures:

[3] See, e.g., King and Rebelo (2000).

$$\tilde{c}_t = \chi\,\hat{c}_t + (1-\chi)\,\hat{c}_{t-1}; \qquad \chi > 0$$

$$\tilde{g}_t = \psi\,\hat{g}_t + (1-\psi)\,\hat{g}_{t-1}; \qquad \psi > 0 \tag{4}$$

$$\tilde{m}_t = \omega\,\hat{m}_t + (1-\omega)\,\hat{m}_{t-1}; \qquad \omega > 0$$

The standard way to justify these assumptions are two. First, if the underlying goods are durable then they may yield services for more than one period.

In this case, the weights χ, ψ and ω should be between zero and one (see, e.g., Eichenbaum et al. (1988)). If the underlying goods generate habit persistence, past consumption may serve like a standard for comparison. In this case, weights χ, ψ and ω should be greater than one (Constantinides (1990)). In particular, in the case of public goods and merit goods, lagged consumption expenditures may allow for potential important interactions between consumptions (e.g., higher education and/or health expenditures may raise standard of living perceptions and therefore stimulate future private consumption).

3.3 Private, Public, and Merit Goods Consumption

Let $\tilde{C}, \tilde{G},$ and $\tilde{M}$ denote the private, public, and merit goods aggregate "effective" consumption in this economy. Then, we make the following definitions:

$$\hat{c} = \frac{\tilde{C}}{N\,Z}$$

$$\hat{g} = \frac{\tilde{G}}{N\,Z}\upsilon(N) \tag{5}$$

$$\hat{\mathrm{m}} = \frac{\tilde{\mathrm{M}}}{\mathrm{N\,Z}}\varphi(\mathrm{N},\mathrm{D})$$

First, as the first of these equations makes clear, we think of "effective consumption," as consumption per technologically efficient household. This is simply a convenient normalization that is common place in the RBC and growth literatures.[4] As a consequence of this normalization, we can focus on a transformed economy such that the steady state growth path of the original economy corresponds to a constant steady state in the transformed economy.

[4] See, e.g., King and Rebelo (2000).

Second, $\upsilon(.)$ is a positive and non decreasing function of N that is bounded below by 1 and above by N. The idea, in the second of these equations, is that ("impure") public goods are to some extent non-rival in consumption. Thus, in the two extreme opposite cases of "pure" public goods, $\upsilon(N) = N$, and congested public goods, $\upsilon(N) = 1$, we have:

$$Z\ \hat{g} = \frac{\hat{G}}{N}.N = \hat{G}$$

and

$$Z\ \hat{g} = \frac{\hat{G}}{N}\ 1 = \frac{\hat{G}}{N},$$

respectively.

Likewise, following Musgrave (1959), we think of merit goods as goods that are provided by the government on paternalistic grounds (e.g., individuals, ought to consume them even if they (could) would not, acting on their own self-interest). Since merit goods are thought to have positive externalities[5]. For that matter, we take $\varphi(.,.)$ to be a positive and non decreasing function of *N and D*, that is bounded below by 1 and above by *N*. D stands for a vector of demographic characteristics that may play a role in the conversion of aggregate merits good consumption to the corresponding average or representative. For example, education is consumed relatively more by the young and health relatively more by the old. Thus, to the extent that households have relatively more old and young members they get more services from aggregate consumption of the merit goods. The incorporation of $\phi(,.,)$ and $\upsilon(.)$ will be exploited later in the empirical analysis. In this section, we are only interested to show that the non-rivalness of the public and merit goods, does not affect the substitutability between these goods and private goods, qualitatively.

Combining our assumptions about the consumption services of the representative household we have:

[5] See, e.g., Rosen (1999, pp. 51-53).

$$\tilde{c}_t = \chi \hat{c}_t + (1-\chi)\hat{c}_{t-1}$$
$$= \chi \frac{\hat{C}_t}{N_t} + (1-\chi)\frac{\hat{C}_{t-1}}{N_{t-1}}$$

$$\tilde{g}_t = \psi \hat{g}_t + (1-\psi)\hat{g}_{t-1}$$
$$= \psi \frac{\hat{G}_t}{N_t}\upsilon(N_t) - (1-\psi)\frac{\hat{G}_{t-1}}{N_{t-1}}\upsilon(N_{t-1}) \tag{6}$$

$$\tilde{m}_t = \omega \frac{\hat{M}_t}{N_t}\phi(N_t D_t) + (1-\omega)\frac{\hat{M}_{t-1}}{N_{t-1}}\phi(N_{t-1}, D_{t-1}).$$

For the most part we shall work with $\tilde{c}_t$, $\tilde{g}_t$, and $\tilde{m}_t$.

The other difference between private and public goods is, of course, that the former are provided by the private sector while the latter are provided by the government. For our purposes, this means that $\{\tilde{c}_t\}_{t=0}^{\infty}$ is decided by the households while $\{\tilde{g}_t\}_{t=0}^{\infty}$ and $\{\tilde{m}_t\}_{t=0}^{\infty}$ are decided by the government.

3.4 Substitutability and the Form of the Temporal Utility Function

Following the literature, we take $\tilde{c}$ and $\tilde{g}$ $(\tilde{m})$ to be "Edgeworth" substitutes, independent or complements depending on whether the cross partial derivative of the temporal utility function $u_{\tilde{c}\tilde{g}}$ $(u_{\tilde{c}\tilde{m}})$ is negative, zero, or positive. Obviously, then, the substitutability of private and public (merit) goods consumption depends exclusively on the form of the temporal utility function.[6]

Although in the empirical part of our work we shall not employ a particular functional form, it is instructive to show first that the most commonly used

[6] It can be verified that time separability does not affect the sign of the pertinent substitutability relationships.

specifications imply restrictions that severely limit the nature of the above mentioned substitutability relationship.

Model A (Neoclassical Temporal Utility with Linear Effective Consumption):[7]

$$u(\tilde{c},\tilde{g},\tilde{m}) = U(\tilde{c} + \eta\tilde{g} + \vartheta\tilde{m});$$
$$U' > 0, \text{ and } U'' < 0.$$

Since $u_{\tilde{g}} = \eta U'$ and $u_{\tilde{m}} = \vartheta U'$; while $u_{\tilde{c}\tilde{g}} = \eta U''$ and $u_{\tilde{c}\tilde{m}} = \vartheta U''$, and $u_{\tilde{g}\tilde{m}} = \eta\vartheta U''$, it follows that for $\tilde{g}$ and $\tilde{m}$ to be "goods" (i. e., $u_g, u_m \geq 0$), all goods must be ("Edgeworth") substitutes with each other.

Model B (Constant Relative Risk Aversion and Cobb Douglas Effective Consumption[8]**:**

$$u = (\tilde{c},\tilde{g},\tilde{m}) = \frac{\left(\tilde{c}^{1-\eta-\vartheta}\,\tilde{g}^{\eta}\,\tilde{m}^{\vartheta}\right)^{1-\gamma} - 1}{1-\gamma}; \qquad \gamma \geq 0$$

$$\eta, \vartheta, (\eta + \vartheta) \in (0,1)$$

Clearly, $\tilde{c}, \tilde{g}$ and $\tilde{m}$ are "goods", here. And, $u_{\tilde{c}\tilde{g}}$, $u_{\tilde{c}\tilde{m}}$, $c_{\tilde{g}\tilde{m}} \gtreqless 0$ *as* $\gamma \lesseqgtr 1$. That is, if any two goods are substitutes (independents or complements), they must be all Edgeworth substitutes (independent or complements). Substitutability, independence or complementarily depends exclusively on the degree of relative risk aversion. For example, a lot of risk aversion implies that all goods must be Edgeworth substitutes.

Model C (Constant Relative Risk Aversion and CES Effective Consumption):

$$u(\tilde{c},\tilde{g},\tilde{m}) = \frac{[(1-\eta-\vartheta)c_t^{y} + \eta\tilde{g}_t^{y} + \vartheta\tilde{m}_t^{y}]^{\frac{1-\gamma}{y}} - 1}{1-\gamma} \quad ; \qquad \gamma \geq 0 \; ; \; \eta, \vartheta, (\eta+\vartheta) \in (0,1)$$

---

[7] Feldstein (1982), Kormendi (1983), Aschauer (1985) Seater at Mariano (1985), Reid (1985), Graham, Himarios (1991), Graham (1993), Karras (1994), Correia et al. (1995), Kollintzas and Vassilatos (2000).

[8] Bean (1986), Mankiw (1991), Ni (1995)

Again, $\tilde{c}, \tilde{g}$, and $\tilde{m}$ are "goods". Moreover, $u_{\tilde{c}\tilde{y}}$, $u_{\tilde{g}\tilde{m}}$, $u_{\tilde{g}\tilde{m}} \gtreqless 0$ as $\gamma \lesseqgtr 1-\zeta$. Thus, substitutability, independence, or complementarity depends on the degree of relative risk aversion and the elasticity of substitution between any two goods in the production of effective consumption $\frac{1}{1-\zeta}$. Hence, it continues to be the case that if any two goods are ("Edgeworth" substitutes (independent or complements) they all must be substitutes (independents or complements).[9]

Model D (Quadratic Temporal Utility):

$$u(\tilde{c},\tilde{g},\tilde{m}) = \begin{bmatrix} a_c \\ a_g \\ a_m \end{bmatrix}' \begin{bmatrix} \tilde{c} \\ \tilde{g} \\ \tilde{m} \end{bmatrix} - \frac{1}{2} \begin{bmatrix} \tilde{c} \\ \tilde{g} \\ \tilde{m} \end{bmatrix}' \begin{bmatrix} b_{ee} & b_{cg} & b_{cm} \\ b_{cg} & b_{gg} & b_{gm} \\ b_{cm} & b_{gm} & b_{mm} \end{bmatrix} \begin{bmatrix} \tilde{c} \\ \tilde{g} \\ \tilde{m} \end{bmatrix},$$

$$a' = (a_c, a_g, a_m) \geq 0$$

$$B = \begin{bmatrix} b_{cc} & b_{cg} & b_{cm} \\ b_{cg} & b_{gg} & b_{gm} \\ b_{cm} & b_{gm} & b_{mm} \end{bmatrix} \text{ positive definite}$$

Provided that $\tilde{c}, \tilde{g}$, and $\tilde{m}$ are bounded

$$0 \leq (\tilde{c},\tilde{g},\tilde{m})' \leq B^{-1} a$$

they are all "goods" and the concavity assumption is satisfied. Moreover, any pair of goods are Edgeworth substitutes, independent, of complements depending on B. In particular,

$$u_{cg} \gtreqless 0 \text{ as } b_{cg} \gtreqless 0$$

[9] Another problem with this temporal utility function is that one cannot ensure its global concavity without further restricting γ and ζ.

$$u_{cm} \gtreqless 0 \text{ as } b_{cm} \gtreqless 0$$

and

$$u_{gm} \gtreqless 0 \text{ as } b_{gm} \gtreqless 0.$$

Although this temporal utility does not restrict the nature of the relations substitutability, it is not used in empirical work for it is almost impossible to test or impose the boundedness condition a priori.[10]

To summarize, in the case of a neoclassical temporal utility function with linear effective consumption, public goods consumption at merit goods consumption must be substitute with private goods consumption if they are to be goods (i.e., strictly increasing temporal utility function). In the case of Constant Relative Risk Aversion temporal utility function with Cobb-Douglas effective consumption, public goods consumption and merit goods consumption will be either substitutes or complements with private goods consumption depending exclusively on the coefficient at relative risk aversion. Typical risk aversion (i.e., $\gamma>1$) implying that any pair of consumptions are substitutes. In the case of constant relative risk aversion temporal utility function with constant elasticity of substitution effective consumption, the situation is similar to the previous case. The only difference is that any pair of consumptions must be substitutes or complements depending on the coefficient of relative risk aversion and the elasticity of substitution.[11] Relatively high risk aversion (i.e., $\gamma>1$) and strong inputs substitution in effective production (i.e., $\frac{1}{1-\zeta} > 1$) implying all consumptions are substitutes. Even if one does not object to the idea of Edgeworth substitutability depend on such things like the coefficient or relative risk aversion, the fact of the matter is that these specification severely restrict the substitution relations in the presence of three goods. For example, (this specification do not allow for public and private goods consumptions to be substitutes while merit and private goods

[10] A similar specification where all variables where in logs could also be employed. In this case the consumption aggregator should be translog and the capital transitions Cobb-Douglas. See, Eckstein et al. (1996) for details.

[11] This, of course, is common for any pair of consumptions.

consumptions are complements. The quadratic temporal utility case does not have these problems.

3.5 An Approximate Solution

Households seek a contingency plan for their consumption expenditures, $\{\hat{c}(t)\}_{t=0}^{\infty}$, so as to maximize their expected life time utility subject to their budget constraint. The representative household by giving up one unit of consumption expenditures in any period t gets a stochastic after tax return of R_{t+1} in the next period. A necessary condition of this problem is the (Euler) condition:[12]

$$\begin{aligned} &E_t[\chi u_{\tilde{c}_t} + \beta(1-\chi)u_{\tilde{c}_{t+1}}] = \\ &\beta E_t[\chi u_{\tilde{c}_{t+1}} + \beta(1-\chi)u_{\tilde{c}_{t+2}}] \; R_{t+1} \end{aligned} \tag{7}$$

where $\beta = \tilde{\beta}/(1+g_z)$.

When there is no durable goods/habit formation (i.e., χ=1), this collapses to the standard Euler Condition of the neoclassical growth model:

$$u_{\tilde{c}_t} = \beta E_t u_{\tilde{c}_{t+1}} R_{t+1}.$$

The latter may be used to illustrate the concept of Edgeworth substitutability/complementarity. To see this note that the RHS of the preceding equation is the expected discounted benefit from one unit of assets invested in the current period. Thus, it may be interpreted as the opportunity cost of consumption in the current period, p_{c_t}. That is,

$$u_{c_t} = p_{c_t}.$$

The last equation, in turn, may be interpreted as the (inverse) demand for current private consumption. Then, if private consumption and, say, public goods consumption are Edgeworth substitutes (complements) an increase in public goods

[12] Under the curvature restrictions imposed on the utility function, the standard nonnegativity conditions and the underlying initial and transversality conditions, the Euler condition is also a sufficient condition. See, e.g., Stokey et al. (1989, pp. 280-83).

consumption lowers (increases) the demand for private consumption at any given price, p_{c_t}. The situation is depicted in Figure 1, below.

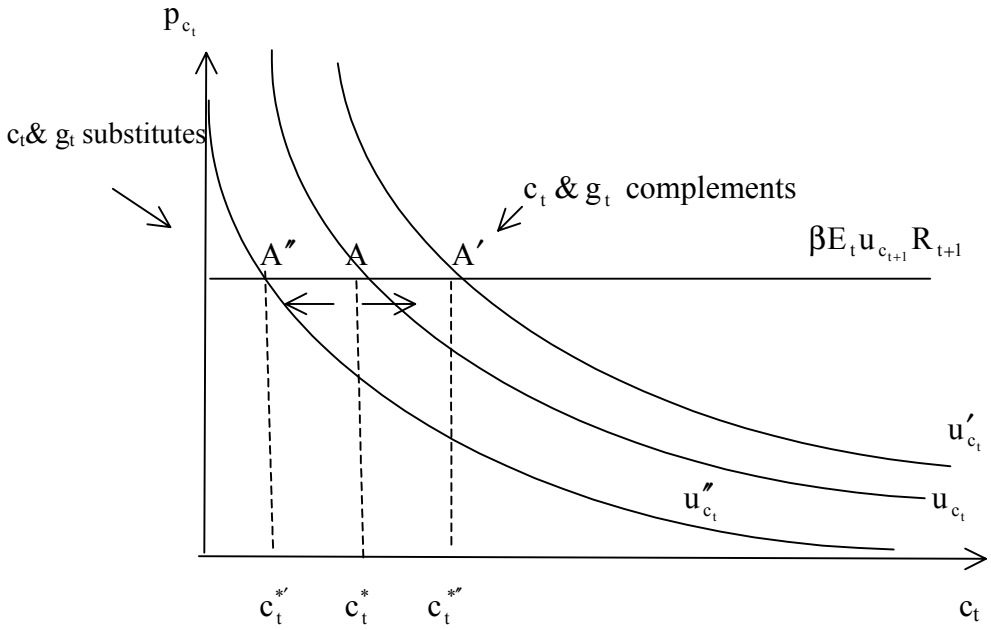

Figure 1: An illustration of Edgeworth substitutability/complementarity

In fact, the proceeding illustration suggests a strategy for investigating the relation between private consumption and public goods consumption. This relation can be investigated around the steady state growth path of the economy without the need for specifying any particular temporal utility function. The strict concavity of the utility function is all that is needed tor pinpoint these relations using an approximation around the steady state growth path.

First, we need to assume that such an (interior) steady state growth path exists.[13] Then, following Hall (1978), it is straightforward to establish the following:

Proposition: Let $\{\bar{c}, \bar{g}_t, \bar{m}_t \bar{R}_t\}_{t=0}^{\infty}$ denote the deviations of an equilibrium path $\{\tilde{c}, \tilde{g}_t, \tilde{m}_t, R_t\}_{t=0}^{\infty}$ from its constant steady state growth path $(\tilde{c}, \tilde{g}, \tilde{m}, R)$. Then, depending on the value of χ these deviations must satisfy the following regression equations:

[13] See, e.g., Stokey et al. (1989, pp. 131-43).

For $\chi \neq 1$,

$$\bar{c}_t = a_1\, \bar{g}_t + a_2\, \bar{m}_t + a_3\, \bar{c}_{t-1} + a_4\, \bar{R}_{t-1} + a_5\, \bar{g}_{t-1} + a_6\, \bar{m}_{t-1} + a_7\, \bar{c}_{t-2} + a_8\, \bar{g}_{t-2} + a_9\, \bar{m}_{t-2} + \varepsilon_t \quad (8)$$

where:

$$a_1 = -\frac{u_{\tilde{c}\tilde{g}}}{u_{\tilde{c}\tilde{c}}}, \quad a_2 = -\frac{u_{\tilde{c}\tilde{m}}}{u_{\tilde{c}\tilde{c}}}, \quad a_3 = -\frac{R\chi - (1-\chi)}{\beta R(1-\chi)}$$

$$a_4 = -\frac{\chi + \beta(1-\chi)}{\beta R(1-\chi)} \frac{u_{\tilde{c}}}{u_{\tilde{c}\tilde{c}}}, \quad a_5 = -a_3\, a_1, \quad a_6 = -a_3\, a_2$$

$$a_7 = \frac{\chi}{\beta^2 R(1-\chi)}, \quad a_8 = -a_7\, a_1, \quad a_9 = -a_8\, a_2$$

And, for χ=1:

$$\bar{c}_t = a_1 \bar{g}_t + a_2\, \bar{m}_t + a_{10}\, \bar{R}_t + a_{11}\, \bar{c}_{t-1} + a_{12}\, \bar{g}_{t-1} + a_{13}\, \bar{m}_{t-1} + \eta_t \quad (9)$$

where:

$$a_{10} = -\frac{1}{R} \frac{u_{\tilde{c}}}{u_{\tilde{c}\tilde{c}}}, \quad a_{11} = \frac{1}{\beta R}, \quad a_{12} = -a_{11}\, a_1, \quad a_{13} = -a_{11}\, a_2$$

and all partial derivatives of the temporal utility function $u(\tilde{c}, \tilde{g}, \tilde{m}, \tilde{R})$ are evaluated at the constant steady state growth path (c, g, m):

Finally, ε_t and η_t are regression errors, in the sense that:

$$E_t\, \varepsilon_t = E_t\, \eta_t = 0, \qquad \forall t.$$

The main implication of this result is that one can conveniently characterize the relation between private consumption and public goods consumption as well as the relation between private consumption and merit goods consumption. That is, since

u_{cc} must be negative by virtue of the strict concavity of the utility function, u_{cg} and u_{cm}, completely characterize the sign in α_1 and α_2, respectively.

Obviously, c_t and g_t are Edgeworth substitutes, independents, or complements around the steady state growth path, if and only if $\alpha_1 \gtreqless 0$. Likewise for c_t and m_t.

Further, it is interesting to note two more implications of this proposition. First, the relationships between c_t and g_t and between c_t and m_t do not depend on the durability of the goods involved or the possibility of habit formation. That is, they do not depend on χ, ψ, and ω. Further, they do not depend on the congestion/non-rivalness properties of g_t of m_t. That is, $\upsilon(N)$ and $\varphi(N,D)$. Second, since the deviations from the steady state growth path could be measured in logs, the coefficients α_1 and α_2 may be interpreted as elasticities for deviations from the steady state growth path.[14] The magnitude of these elasticities will depend, of course, on χ, ψ, ω as well as $\upsilon(N)$ and $\varphi(N,D)$.

4. Dynamic panel estimate

To exploit the time dimension (T=26) of our sample which includes twelve (N=12) European Union countries, we used estimation techniques appropriate for dynamic panels. This is, of course, consistent with the dynamic nature of the underlying Euler equations. We have chosen to estimate these equations in first differences of logs. This corresponds to a situation where labor augmenting technological progress follows a random walk with drift or, at any rate, the deviation from the steady state $(\bar{c}, \bar{g}, \bar{m}, \bar{R})$ can be approximated by taking first differences.[15] Then,both Euler Conditions (8) and (9) are of the form: [16]

$$\Delta Y_{it} = \gamma \Delta Y_{it-1} + \Delta \boldsymbol{X_{it}}' \boldsymbol{\beta} + e_{it} \qquad (10)$$

where Δ is the first-difference operator and where the $\mathbf{X_{it}}$ matrix contains the relevant lags and possibly other pre-determined variables.

---

[14] See, e.g., King and Rebelo (2000).

[15] Our model is also consistent with an endogenous growth scenario, where growth is common across countries and follows a balanced growth path.

[16] Readers familiar with dynamic panel estimation should realize that in our case there is a theoretical restriction for no fixed effects. This is because the consumption deviation from the steady state for each and every country follow (8) or (9). In particular, this does not depend on the particular method of detrending or defining deviations from the steady state growth path.

In the estimated equations, we added also a demographic variable (pp), which is the ratio of the working age population (15-64) to the total population. This variable is justified by the theoretical model, being only a preference shifter accounting for the possibility that the relation between private and government consumption might be affected by demographic factors, as well. For, merit goods are mostly made by education and health expenditures and both should be inversely related to the working age population share.

Instead of using as Anderson-Hsiao (1981) past values of ΔY_{it-1} only as instruments (which amounts in simulation studies to large estimator variance), Arellano and Bond (1991) suggest using several GMM estimators exploiting further moment conditions. Likewise, we used GMM estimates, taking as instruments the past levels of the left-hand side variable starting two-periods before $(Y_{i,t-2},...Y_{i,t-s})$ and the past values of the exogenous differenced terms $(\Delta X_{i,t-1,}...\Delta X_{i,t-h})$. Finally, we implemented the GMM estimates by using Newey-West covariance matrices.

Data limitations (i.e., T=26) and the number of lags in (8) reduce the available degrees of freedom in this case. For, there are extra lags going from consumption to consumption expenditures when $\chi \neq 1$. Moreover, the need for using instruments that involve higher order lags of the RHS variables make estimation of (8) infeasible. Thus, we ended up estimating (9) only.

The main finding of our paper is in Table 5. There, it is evident that the regression equations we estimated perform quite well since both the sign and the relative sizes of the estimates are consistent with the theory (e.g. α_{10} , α_{11} >0). The goodness of fit, which is shown by the uncentered RSQ, since regressions do not include an intercept, is also satisfactory. Most importantly, the J-tests support the plausibility of the instruments restrictions, in the sense that the overidentification restrictions of the theory are not rejected by the data. So that, the estimation results can be used for valid inference. Further, the results are quite stable in the sense that the signs and relative sizes of the parameters are quite robust, also in the companion regressions, presented in Tables 6-8.

In particular, the results are robust to several definitions/measurements. These definitions/measurements are summarized, below:

g = Public goods defined as the sum of the *General Public Services, Defense* and *Public Order and Safety* components of the COFOG classification of Government Consumption; deflated by the Household Consumption Deflator and divided by total population.

g_2 = Public goods defined as the sum of the *Defense* and Public Order and Safety components of the COFOG classification of Government Consumption; deflated by the Household Consumption Deflator and divided by total population.

g_3 = As g_3 but deflated by the Household Consumption Deflator

gg = As g multiplied by total population

gg_2 = As g_2 multiplied by total population

m = Merit goods defined as the sum of the *Education, Health, Housing and Community Amenities and Recreational Cultural and Religious Affairs* components of COFOG classification of Government Consumption; deflated by the Household Consumption Deflator and divided by total population.

m_2 = Merit goods defined as the sum of the *Education* and *Health* components of COFOG classification of Government Consumption; deflated by the Household Consumption Deflator and divided by total population.

g_c = Government Consumption deflated by the Government Consumption Deflator and divided by total population.

def = *Defense* components of the COFOG classification; deflated by the Household Consumption Deflator and divided by total population.

edu = *Education* components of the COFOG classification; deflated by the Household Consumption Deflator and divided by total population.

hea = *Health* components of the COFOG classification; deflated by the Household Consumption Deflator and divided by total population.

Overall, the results reported in Tables 5 to 7 are generally robust and consistent with theory. In all cases they substantiate the fact that public goods are substitutes and merit goods are complements to private consumption.

Other than the sign feature of the a_1 and a_2 estimates and the implied Edgeworth substitutability for public goods (i.e., $u_{cg} < 0$) and complementarity for merit goods (i.e., $u_{cg} > 0$) given the sign of a_{10} (i.e., $\frac{-u_c}{u_{cc}} > 0$), the sizes of these estimates are quite interesting. First, the size of the merit goods elasticity is always larger than the size of the public goods elasticity.

In Table 5, we estimate exactly equation (9). Merit goods are not only always complementary but also display lagged values alternating the sign as required by the theoretical restrictions. As already mentioned, the average elasticity is positive and bigger in absolute value than the elasticity found for the public goods variables. The exclusion tests we report for both public and merit goods variables show that merit goods always belong to the regression. Conversely, the public goods variables tend to be insignificant the higher is their public good content, irrespective of the deflator choice (g_2, g_3). This is also reflected in the exclusion tests and is confirmed in Table 8, in which we report the response of private consumption to major items of government consumption. Namely, defence spending has a smaller elasticity than public order and in most cases its elasticity is null.
We take this to be consistent with the very nature of these goods. That is the purer the public goods the less the expected interaction with private consumption.
In the same table we find for merit goods that education has a bigger effect on private consumption with respect to health when the interest rate variable is omitted while the effect is about the same when the latter enters the specification.

All these results would imply - as we actually found in Table 6 - an aggregate relation for private and government consumption in which the estimated elasticity is positive because of the larger merit goods share (Table 2) and of the higher elasticity of the merit goods.

There could be many reasons for complementarity of the merit goods. First, It should be emphasized that our simple model cannot explain the source of, say, the complementarity of merit goods. There could be many reasons contributing to this effect. First, merit goods may increase the consumption of complement private goods because they are relatively inefficient (e.g., public schools and private tutors). Second,

merit goods may increase the consumption of private goods because they are increasing the demand for other goods (public schools, books newspapers and magazines). Complementarity of merit goods may due to the *inefficiency* of the service. However, inefficiency is not necessarily bad quality or bad quality only but can also deal with the red tape costs for taking the service (time lost for lines, applications, eligibility requirements etc.). Another reason of the complementarity could be the *preference* for private consunption that perhaps fits more the education case: e.g., some families – regardless of possible differences in quality – may prefer that their children go to private school both for religious, ideological or social reasons.

5. *Conclusions*

In this paper, we estimate the relationship between public and private consumption, splitting the former into two categories. The first category, "public goods," includes defense, public order, and justice. The second category, "merit goods," includes health, education, and other services that could have been provided privately.

We construct a data panel from 1970 to 1996, made up from twelve European Union countries. The public and merit goods categories are generated by adopting a functional classification of general government spending.

The estimates are fairly robust in showing that public goods substitute while market goods always complement private consumption. And, confirming recent studies, since merit goods consumption is about two thirds of government consumption, this implies that in the aggregate government and private consumption are complements. It is an open question to assess how distortionary could be for general equilibrium models assuming that sustitutability prevails.

There are several ways we could extend our analysis. First, we could incorporate leisure into the utility function to account for the possible interaction between government consumption and leisure. Second, we could endogenize government consumption decisions, solving the corresponding Ramsey Planner

problem. There is a system of equations involving private, public goods and merit goods consumptions that could be estimated.

Finally, previous examples on the possible reasons behind the complementarity of merit goods seem to suggest that complementarity is associated with inefficiency when it occurs *within* the same spending category (e.g., health or education), while positive externalities could explain complementarity whenever – say - public schools or public health improve the consumption of different private goods, i.e. when the relation is *between* spending categories. Still analyzing government functional spending and extending the field to this more complex case, would require wider and better data then the available ones but could possibly contribute to a deeper understanding of the Welfare State effects on the EU economies.

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Data appendix

We used OECD data both for reporting the economic classification of public spending in thirteen European countries (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Norway, Portugal, Spain, Sweden, United Kingdom) and for constructing *functional* data for general government spending. The functional data follow the United Nations COFOG (1980) guidelines.

To be consistent with the NIPA definitions, we used the General Government aggregata (central government, local government, social security institutions). Altogether, we used three OECD datasets:

1 *National Accounts (1999):*
  1.1 *Main Aggregates* (vol. 1)
  1.2 *Detailed Tables* (vol. 2)
2. *Fiscal Position and Business Cycles* (2000),
3.*Social Expenditure* (1999).

The countries have been selected on the basis of data availability only. However, the OECD/NIPA data (1.1-1.2) do not refer to the same SNA/SEC systems for all countries as it is shown in the following table:

Table 7 – SNA reference system by country and source of data

Country	1.1 *Main Aggregates*	1.2 *Detailed Tables*
Austria	1968 SNA	Former system
Belgium	1968 SNA	1968 SNA
Denmark	1968 SNA	1968 SNA
Finland	1968 SNA	1968 SNA
France	1968 SNA	1968 SNA
Germany	1968 SNA	1968 SNA
Greece	1968 SNA	Former System
Italy	1968 SNA	1968 SNA
Norway	1968 SNA	1968 SNA
Portugal	1968 SNA	1968 SNA
Spain	1968 SNA	1968 SNA
Sweden	1968 SNA	1968 SNA
United Kingdom	1968 SNA	1968 SNA

The data obtained by the *Main Aggregates* are: GDP and Government Final Expenditures at current and at 1990 prices. The *Detailed Tables* have been used to evaluate the functional classification of the public spending which applies to all spending categories.

The COFOG classification considers ten spending categories:

1. General Public Services
2. Defence
3. Public Order and Safety
4. Education
5. Health
6. Social Security and Welfare
7. Housing and Community Amenities
8. Recreational, Cultural and Religious Affairs

9. Economic Services
10. Other Functions.

We calculated *public goods* as the sum of items 1, 2, 3 while obtaining *merit goods* as the sum of items: 4, 5, 6, 7, 8. Both components account for about the 90% of the final government consumption expenditures, the remaining items being a small residual component (*Other Functions*) and the *Economic Services* which applies also – for the appropriate items (1.2) - to subsidies and capital expenditures.

We used the OECD *Social Expenditure Database* to evaluate the social expenditure components, reported in the Welfare State domain of Tables 3 and 4. Despite the accounting systems are in most cases the same (Table 7), some country differences must be noticed:

Germany: data refer to the West Germany until 1990 and to the Unified Germany afterwards.

Greece: *Social Security and Welfare* (6) includes the spending functions (7)-(8). The residual item (10) is included into the item (9).

Spain: *Public Order and Safety* (3) is included into the *General Public Services* category (1).

Sweden: Since 1985, the classification follows COFOG guidelines. Before 1985, *General Public Services* includes *Public order and Safety* while *General Research* is included into the *General Public Services* (1980-1) and into the *Education* items (1982-5), respectively.

Finally, the detailed economic classification of public spending consistent with the NIPA is obtained by the database *Fiscal Position and Business Cycle*.

Data used for regressions

To obtain a balanced panel, we removed from our sample Belgium for which only four data were available, yielding a twelve country sample ranging from 1970 to 1996 (T = 26). The other data used in the panel regressions (demographic variables, real interest rate components) stem from the Oecd *Economic Outlook* database.

Table 1- Major types of expenditures as % shares of total general government spending

	Consumption	Transfers	Investment	Interests	Total/GDP		Consumption	Transfers	Investment	Interests	Total/GDP
Austria						**Denmark**					
71-75	41.6	39.9	12.1	2.6	40.5	71-75					
76-80	39.3	39.4	9.1	4.4	46.2	76-80					
81-85	39.1	40.1	7.3	6.3	49.1	81-85					
86-90	38.9	41.2	6.4	7.8	50.0	88-90	45.9	34.5	3.3	13.0	56.4
91-95	38.8	41.6	6.0	8.2	51.5	91-95	44.1	37.1	3.0	11.6	59.0
96-99	38.9	42.3	4.1	8.0	51.1	96-99	45.7	37.4	3.2	9.6	56.4
Finland						**France**					
71-75	51.1	32.1	6.9	2.4	31.0	71-75	47.8	34.2	9.3	2.3	38.7
76-80	50.5	34.6	5.8	2.3	36.5	76-80	48.2	34.9	7.6	2.8	43.8
81-85	50.0	35.0	6.4	3.7	39.2	81-85	46.9	35.9	6.4	4.7	50.1
86-90	48.6	36.2	8.0	3.6	42.9	86-90	45.5	36.4	6.7	5.5	50.0
91-95	43.0	43.0	5.6	6.1	56.2	91-95	44.9	37.4	6.7	6.5	52.6
96-99	44.1	42.9	5.8	7.9	50.2	96-99	45.3	38.3	5.7	6.9	52.8
Germany						**Greece**					
71-75	43.4	37.7	9.7	2.7	41.5	71-75					
76-80	42.3	40.4	7.3	3.6	46.1	76-80					28.9
81-85	42.9	40.5	5.6	5.9	46.6	81-85					37.6
86-90	42.7	40.9	5.2	6.1	44.5	86-90	31.9	34.4	6.9	15.0	43.3
91-95	43.2	40.6	5.9	7.3	45.6	91-95	31.1	34.6	6.9	22.8	45.9
96-99	41.9	44.2	4.1	7.8	46.2	96-99	34.6	38.9	8.5	19.6	43.3
Italy						**Norway**					
71-75	40.0	38.4	8.3	6.3	37.2	71-75	46.7	29.6	12.2	4.5	38.1
76-80	35.3	37.2	7.6	10.9	40.8	76-80	44.3	30.3	10.3	5.6	43.7
81-85	33.9	35.8	7.6	14.8	48.4	81-85	43.8	33.6	7.3	7.1	43.1
86-90	33.0	36.1	6.6	16.4	51.2	86-90	42.0	36.1	7.8	7.7	48.3
91-95	32.5	36.5	4.9	20.8	53.8	91-95	42.9	37.9	6.9	6.3	50.2
96-99	36.3	36.9	4.7	17.9	49.8	96-99	45.6	38.2	7.7	4.7	45.4
Portugal						**Spain**					
71-75	59.2	21.8	10.2	2.2	21.9	71-75	49.2	34.4	12.1	1.4	21.5
76-80	42.1	33.1	10.6	6.7	31.2	76-80	48.5	37.6	7.8	1.2	26.9
81-85	33.3	24.9	8.7	14.6	41.3	81-85	44.1	37.3	8.0	2.7	35.1
86-90	37.1	29.9	8.3	19.0	39.3	86-90	42.4	34.3	10.2	10.0	38.4
91-95	39.8	33.9	8.3	15.4	44.1	91-95	42.8	35.4	9.6	10.5	42.7
96-99	42.7	38.6	9.7	9.0	43.8	96-99	43.9	36.0	7.7	11.3	39.9
Sweden						**UK**					
71-75	53.5	29.6	10.6	4.4	44.5	71-75					
76-80	51.4	32.7	7.5	5.1	54.6	76-80					
81-85	48.1	31.9	5.8	11.3	60.4	81-85					
86-90	48.2	35.0	5.3	10.2	56.1	86-90	47.9	32.6	5.4	6.4	41.3
91-95	43.5	38.3	4.6	9.3	63.6	91-95	45.7	38.0	4.9	5.3	44.6
96-99	46.4	37.8	4.2	10.6	57.9	96-99	45.5	40.0	3.3	6.8	40.8

Source: Oecd, *Fiscal Position and Business Cycle (FPBC) Database*, June, 2000

Table 2 - Public and Merit Goods Components of Government Consumption

	Govt/private consumption ratio		Government consumption % composition			
	Nominal	Real	Public goods	Merit goods Total	Education	Health
Austria						
1971-75	28.9	36.8				
1976-80	32.3	36.7	27.9	63.1	20.7	23.1
1981-85	33.3	36.9	26.8	63.8	21.1	22.8
1986-90	34.1	35.0	25.4	64.3	21.2	23.8
1991-95	35.4	33.2	24.8	65.1	21.2	25
Denmark						
1971-75	44.1	44.3	22.5	67.6	23.4	22.1
1976-80	47.6	47.9	20.1	65.9	22.0	20.5
1981-85	52.8	54.8	19.7	64.8	21.2	18.7
1986-90	50.7	51.7	19.4	66.0	20.8	18.7
1991-95	51.8	50.7	18.2	69.1	21.1	19.3
Finland						
1971-75	28.1	34.5				
1976-80	32.5	39.5	24.0	67.7	28.0	21.6
1981-85	35.2	41.2	23.7	68.4	26.0	22.2
1986-90	38.2	40.0	22.3	70.3	25.5	22.5
1991-95	41.5	42.5	21.9	69.4	25.7	21.8
France						
1971-75	26.5	29.5				
1976-80	30.0	29.8				
1981-85	31.8	31.1	33.3	59.2	25.9	16.5
1986-90	30.7	30.6	34.0	59.3	25.6	16.7
1991-95	31.8	31.7	32.5	60.9	26.1	17.3
Germany						
1971-75	33.3	36.7	35.8	58.6	19.1	26.6
1976-80	35.0	36.3	32.6	62.4	20.1	29.1
1981-85	35.4	37.4	32.0	63.4	20.1	29.4
1986-90	35.1	35.6	31.0	64.6	19.1	30.5
1991-95	34.7	33.6	26.6	69.2	18.6	32.2
Greece						
1971-75	15.5		74.7	23.7	14.3	8.2
1976-80	19.5		73.8	24.1	13.9	9.0
1981-85	22.7		70.7	25.4	14.0	9.9
1986-90	23.0		68.0	27.8	14.8	11.5
1991-95						

Sources: see Table 1. For the public and merit good distinction, see the *Statistical Appendix*. For France, the time periods are 1983-85 and 1991-93, respectively.

Table 2 - Public and Merit Goods Components of Government Consumption

	Govt/private consumption ratio		Government consumption % composition			
	Nominal	Real	Public goods	Merit goods Total	Education	Health
Italy						
1971-75	24.3	33.4				
1976-80	24.0	31.6				
1981-85	27.0	30.8	35.6	57.4	29.0	19.5
1986-90	27.6	29.7	37.2	56.1	28.1	19.3
1991-95	27.8	28.7	37.8	56.3	26.6	21.1
Norway						
1971-75	35.2	34.3	27.6	51.4	26.2	15.7
1976-80	38.7	36.8	25.1	54.6	25.3	18.8
1981-85	40.2	40.1	25.3	56.0	24.1	20.8
1986-90	40.0	39.4	25.6	57.5	23.9	21.7
1991-95	43.2	43.6				
Portugal						
1971-75	18.5	13.2				
1976-80	18.7	17.5				
1981-85	20.3	21.5				
1986-90	23.1	24.1	37.0	53.3	28.0	16.7
1991-95	26.9	25.5	34.1	55.5	30.3	17.1
Spain						
1971-75	15.1	15.9				
1976-80	18.4	17.8				
1981-85	21.7	21.2				
1986-90	23.9	24.0	25.6	61.1	18.5	23.6
1991-95	26.9	26.6	26.6	61.6	21.4	24.9
Sweden						
1971-75	44.1	46.3				
1976-80	52.9	49.9				
1981-85	55.4	55.5	23.1	69.4	20.2	25.1
1986-90	51.7	52.9	23.4	69.0	19.8	24.2
1991-95	50.6	55.7	25.2	66.8	19.3	19.2
UK						
1971-75	31.7	40.5				
1976-80	35.1	41.7	34.7	55.4	22.5	21.5
1981-85	36.2	40.1	35.7	54.9	21.0	22.1
1986-90	32.4	33.7	34.5	56.1	20.9	22.8
1991-95	34.1	33.6	32.3	59.6	20.5	25.6

Sources: see Table 1. For the public and merit good distinction, see the *Statistical Appendix* For the UK the time period is 1977-80.

Table 3 - The Structure of General Government Expenditure in 1981 (GDP % shares)

	Denmark		*France*		*Germany*		*Italy*		*United Kingdom(1979)*		Spain (1985)	Norway
			1983	*1981*								
Total Expenditure	**59**	*59.5*	**52.3**	*49.2*	**49.8**	*49.3*	**46.6**	*51.2*	**45.5**	*43.2*	**42.6**	**44.5**
The traditional domain:												
Public goods	**7.8**	*8*	**8.2**	*7.5*	**8.6**	*6.8*	**6.8**	*7*	**7.8**	*7.7*	**5.5**	**5.8**
Defence	2.5	*2.6*	3.5	*3.8*	2.9	*2.9*	1.8	*2*	4.5	*4.5*	2	2.9
General public services[17]	5.2	*5.4*	4.7	*3.7*	5.7	*3.9*	5	*5*	3.3	*3.2*	3.6	2.9
Welfare state:	**37.7**	*33.8*	**39.1**	*33.2*	**30.9**	*31*	**27.2**	*29.8*	**25.5**	*22.7*	**24.8**	**26.8**
Merit goods	**16.4**	*17.4*	**19.2**	*16*	**14**	*14.3*	**12.8**	*14*	**13.6**	*13.6*	**11.3**	**13.9**
Education	7.7	*8.4*	5.7	*5.9*	5.2	*5.2*	5.4	*6.1*	5.2	*5.1*	3.7	5.7
Health	5.7	*5.7*	8.9	*6.4*	6.5	*6.8*	5.4	*6*	4.6	*4.4*	4.7	5.9
Housing and community amenities	1.3	*1.6*	3.6	*2.8*	1.4	*1.4*	1.5	*1.5*	3.2	*3.5*	2	1.1
Recreational, cultural and religious services	1.7	*1.7*	1.1	*0.9*	0.9	*0.9*	0.5	*0.4*	0.6	*0.6*	0.9	1.2
Income maintenance[18]	**21.3**	*16.4*	**19.9**	*17.2*	**16.9**	*16.7*	**14.4**	*15.8*	**11.9**	*9.1*	**13.5**	**12.9**
Pensions[19]	7.8	*8.1*	11.5	*11.9*	11.6	*12.6*	11	*13.1*	-	*6.5*	8.9	-
Sickness benefits	1,7	*1.2*	0.6	*1.2*	0.5	*0.6*	0.5	*0.8*	-	*0.4*	0.7	-
Family allowances	1,1	*1.2*	2.5	*2.2*	1.8	*1.2*	1.2	*1.2*	-	*1.4*	0.2	-
Unemployment compensations	5	*5.1*	2.3	*1.9*	1.2	*1.4*	0.8	*0.6*	-	*0.7*	2.8	-
Other	5.3	*0.8*	2.4	*-*	1.4	*0.9*	0.8	*-*	-	*-*	0.5	-
The mixed economy:	**12.2**	*10.6*	**6.1**	*6.1*	**7.0**	*7.1*	**12.6**	*14.7*	**8.0**	*8.2*	**7.9**	**11.6**
Economic services	**6.3**	*5.3*	**3.6**	*3.9*	**4.8**	*4.9*	**6.5**	*7.5*	**3.6**	*3.6*	**6**	**8.6**
Interest payments[20]	**5.9**	*5.3*	**2.5**	*2.2*	**2.2**	*2.2*	**6**	*7.2*	**4.4**	*4.6*	**1.9**	**3**
Discrepancy	1.3	*7.1*	-1.1	*2.4*	3.3	*4.4*	0.1	*-0.3*	4.2	*4.6*	4.4	0.3

Note: Unless specified, the data source is: OECD,*National Accounts - Detailed Tables*, several years. The columns in italics report Saunders and Klau (1985) results

[17] "Public order and safety" is included .

[18] Data are from the OECD *Social Expenditure Database.* In the functional classification, "social security and welfare " is the corresponding item. For the UK, we used the *National Accounts* source since the *Social Expenditure Database* begins in 1980.

[19] It includes unfunded pensions, social assistance grants and welfare benefits.

[20] General Government debt interest payments.(OECD, *Fiscal position and business cycles* database). For Denmark, we used the OECD national accounts data for General Government where the item "other" is essentially made by interest payments.

Table 4 - The structure of General Government Expenditure in 1995 (GDP% shares)

	Denmark	France (1993)	Germany	Italy	Norway (1991)	Portugal	Spain	United Kingdom
Total expenditure	59.7	56.6	57.6	52.6	51.3	49.9	47.2	44.3
The traditional domain								
Public goods	**7**	**8.8**	**7.1**	**8**	**6.8**	**6.4**	**5.6**	**7.4**
Defence	1.7	3	1.4	1.7	2.9	2.2	1.5	3.3
General public services	4.3	4.6	3.9	4.5	3	2	1.8	1.9
Public order and safety	1	1.2	1.7	1.8	0.9	2.1	2.2	2.2
Welfare state	**40.2**	**43.6**	**32.8**	**30.1**	**36.4**	**26.8**	**28.4**	**30.1**
Merit goods	**14.5**	**21.7**	**13.3**	**11.9**	**15.5**	**14.1**	**13.2**	**13.3**
Education	7	6	4.4	4.7	6.5	6.8	4.9	5.4
Health	5	10.8	7	5.4	6.8	5	5.5	5.8
Housing and community amenities	1	3.7	1.1	1.2	0.8	1.2	1.7	1.5
Recreational, cultural and religious services	1.5	1.2	0.8	0.6	1.4	1.1	1.2	0.6
Income maintenance	**25.7**	**21.9**	**19.5**	**18.2**	**20.9**	**12.7**	**15.2**	**16.8**
Old-age cash benefits	7.4	10.1	10,1	10.9	5.9	6	8	6.5
Disability cash benefits	1.9	1.1	1,1	1.4	2.8	1.7	1.3	2.6
Occupational injury and disease	0.2	0.4	0.3	0.5	0	-	-	0.2
Sickness benefits	0.6	0.6	0.5	0.1	1.6	0.6	1.1	0.2
Services for the elderly and the disabled people	2.9	0.7	0.6	0.2	3.6	0.2	0.2	0.7
Survivors	0	1.9	0.6	2.6	0.4	1.3	0.9	0.8
Family cash benefits	1.9	2.2	1.2	0.4	2.1	0.7	0.3	1.9
Unemployment	4.4	2.1	2.3	0.9	1.2	0.9	2.4	0.9
Housing benefits	0.8	0.9	0.1	0	0.2	0	0.1	1.8
Other	5.5	2	2.7	1.2	3	1.1	0.9	1.2
The mixed economy	**12**	**8.6**	**15.1**	**16.1**	**10.8**	**12.6**	**11.4**	**6.9**
Economic services	**5.6**	**4.9**	**11.4**	**4.6**	**7.6**	**6.3**	**6.2**	**3.3**
Public debt interests	**6.4**	**3.7**	**3.7**	**11.5**	**3.2**	**6.3**	**5.2**	**3.6**
Discrepancy	0.5	-4.4	2.6	-1.6	-2.7	4.1	1.8	-0.1

Table 5 - Private and government consumption (Dynamic Panel - GMM)

Eq	1	2	3	4	5	6	7
$\Delta c_{i,\,t-1}$	.675 (.175)	.773 (.110)	.464 (.127)	.412 (.135)	.544 (.139)	.538 (.146)	.498 (.110)
Δm_{it}	.353 (.123)	.498 (.063)			.580 (.081)	.603 (.085)	
$\Delta m_{i,t-1}$	.103 (.084)	-.277 (.048)			-.336 (.082)	-.345 (.104)	
$\Delta m2_{it}$			.504 (.081)	.704 (.136)		.	.537 (.093)
$\Delta m2_{i,t-1}$			-.010 (.066)	-.377 (.129)			-.257 (.094)
Δg_{it}	-.102 (.080)	-.067 (.063)	-.062 (.088)				
$\Delta g_{i,t-1}$	-.078 (.065)	-.093 (.038)	-.248 (.062)				
$\Delta g2_{it}$				.028 (.098)		.005 (.077)	
$\Delta g2_{i,t-1}$				.060 (.065)		.054 (.048)	
$\Delta g3_{it}$					.059 (.110)		.060 (.092)
$\Delta g3_{i,t-1}$					.064 (.057)		.020 (.051)
Δpp_{it}		-.375 (.134)	-.218 (.124)	-.181 (.137)	-.148 (.099)	-.184 (.118)	-.225 (.102)
Δr_{it}	.284 (.234)	.082 (.193)	.139 (.173)	.804 (.221)	.389 (.233)	.459 (.248)	.613 (.190)
RSQ	.418	.273	.401	.211	.347	.280	.348
J-Test	$\chi^2(11)$=13.6 Pval=.253	$\chi^2(15)$=15.3 Pval=.426	$\chi^2(13)$=11.4 Pval=.575	$\chi^2(10)$=9.2 Pval=.513	$\chi^2(13)$=11.5 Pval=.570	$\chi^2(13)$=12.1 Pval=.520	$\chi^2(13)$=13.5 Pval=.413
EXCLM	$\chi^2(2)$=9.93 Pval=.01	$\chi^2(2)$=70.0 Pval=.00	$\chi^2(2)$=41.0 Pval=.00	$\chi^2(2)$=29.1 Pval=.00	$\chi^2(2)$=57.8 Pval=.00	$\chi^2(2)$=50.5 Pval=.00	$\chi^2(2)$=36.6 Pval=.00
EXCLG	$\chi^2(2)$=2.54 Pval=.281	$\chi^2(2)$=9.07 Pval=.011	$\chi^2(2)$=23.6 Pval=.00	$\chi^2(2)$=1.1 Pval=.573	$\chi^2(2)$=1.36 Pval=.508	$\chi^2(2)$=1.27 Pval=.530	$\chi^2(2)$=.436 Pval=.804
Instruments	c_{it}(-2,..,-5) Δm_{it}(-2..-5) Δg_{it}(-2..-5) Δr_{it}(-1,..,-5)	c_{it}(-2,.,-5) Δm_{it}(-2..-5) Δg_{it}(-2..-5) Δpp_{it}(-1..-5) Δr_{it}(-1,..-5)	c_{it}(-2,.,-5) $\Delta m2_{it}$(-2..-5) Δg_{it}(-2..-5) Δpp_{it}(-1..-4) Δr_{it}(-1,..,-4)	c_{it}(-2..-4) $\Delta m2_{it}$(-2..-4) $\Delta g2_{it}$(-2,.,-4) Δpp_{it}(-1..-4) Δr_{it}(-1,..,-4)	c_{it}(-2..-5) Δm_{it}(-2,..-5) $\Delta g3_{it}$(-2..-5) Δpp_{it}(-1..-4) Δr_{it}(-1..-4)	c_{it}(-2..-5) $\Delta m2_{it}$(-2..-5) $\Delta g2_{it}$(-2..-5) Δpp_{it}(-1..-4) Δr_{it}(-1..-4)	c_{it}(-2..-5) Δm_{it}(-2..-5) $\Delta g3_{it}$(-2..-5) Δpp_{it}(-1..-4) Δr_{it}(-1,..,-4)

Legend : *c* = per capita household consumption in real terms; *pp* = working age population share (15-64/Total Population); r = after tax real interest rate defined as: r_{it}= $\ln((1+((1-tauc_{it})*(irs_{it}/100)))/(pc_{it}/pc_{i,t-1}))$ where *pc* is the household consumption deflator, *irs* is the short-run interest rate (Oecd, *Economic Outlook*) and *tauc* is the effective consumption tax rate calculated as in Fiorito-Padrini (2001). Except for the population share, all data are logged and first differenced. Data come from Oecd sources and are fully described in the *Statistical Appendix*); *RSQ* =uncentered R-squared; *Instruments* = set of instrumental variables (Z). The autocovariance matrix Z'e used to evaluate the GMM weighting matrix has 4 lags; J(.) is the Hansen statistics asymptotically distributed as a χ^2 (p) where p is the number of overidentifying restrictions; *pval*= marginal significance level of the test. Finally, we report in parentheses the Newey-West standard errors; *m* = merit goods (see text and the *Statistical Appendix*) in real terms (household consumption deflator); *m2*= education and health government consumption in real terms (household consumption deflator); *m3*= merit goods in real terms (government consumption deflator); *g* = public goods (see text and the *Statistical Appendix*) in real terms (household consumption deflator); *g2*= public order and defence government consumption in real terms (household consumption deflator); *g3* = public order and defence government consumption in real terms (government consumption deflator). EXCLM= test for excluding current and past merit goods variables ; EXCLG= test for excluding current and past public goods variables.

Table 6 - Aggregate Private and Government Consumption (Dynamic Panel)

Eq.	$\Delta c_{i\,t}$	$\Delta c_{i,\,t-1}$	$\Delta gc_{i\,t}$	$\Delta pp_{i\,t}$	Δr_{it}	RSQ	DW	INSTRUMENTS	J Test
(1)	OLS	.345 (.051)	.393 (.049)			.500	1.91		
(2)	GMM	.423 (.135)	.400 (.096)			.454		$c_{i,\,t-2..t-5}$; $\Delta gc_{i,\,t-1,\ldots t-4}$	9.43(6) ; pval=.151
(3)		.534 (.105)	.335 (.084)		.223 (.116)	.527		$c_{i,\,t-2..t-5}$; $\Delta gc_{i,\,t-1,\ldots t-4}$ $\Delta r_{it-1,\ldots,\,t-4}$	11.3 (9) pval=.255
(4)		.423 (.102)	.402 (.086)	.142 (.153)	.297 (.126)	.434		$c_{i,\,t-2..t-5}$; $\Delta gc_{i,\,t-1,\ldots t-5}$ $\Delta pp_{i,\,t-1,..t-5}$ $\Delta r_{it-1,\ldots,\,t-5}$	17.8 (15) pval=.274

Legend: See Table 5 for the common elements; *cg* = per capita final government consumption in real terms

Table 7: Private and government consumption: the 'pure' public goods case

Eq	1	2	3	4	5	6
$\Delta c_{i,\,t-1}$	.461 (.101)	.485 (.159)	.403 (.096)	.387 (.104)	.388 (.093)	.218 (.036)
Δm_{it}	.383 (.083)	.379 (.141)			.413 (.043)	.556 (.037)
$\Delta m2_{it}$			.371 (.078)	.395 (.094)		
Δgg_{it}	-.179 (.080)				-.152 (.062)	
$\Delta gg2_{it}$		-.139 (.072)	-.136 (.058)	-.129 (.045)		-.085 (.054)
Δpp_{it}					.038 (.183)	-.094 (.133)
Δr_{it}	.226 (.187)	.572 (.268)	.340 (.169)	.653 (.195)	.362 (.156)	.380 (.167)
RSQ	.457	.352	.527	.442	.448	.429
J-Test	$\chi^2(15)$=13.4 Pval=.573	$\chi^2(15)$=12.2 Pval=.664	$\chi^2(15)$=16.8 Pval=.328	$\chi^2(15)$=15.8 Pval=.394	$\chi^2(15)$=15.4 Pval=.424	$\chi^2(15)$=14.5 Pval=.491
Instruments	c_{it}(-2,.,-5) Δm_{it}(-1,..,-5) Δgg_t(-1,.,-5 Δr_{it}(-1,..,-5)	c_{it}(-2,.,-5) Δm_{it}(-1,..,-5) $\Delta gg2_t$(-1,.,-5) Δr_{it}(-1,..,-5	c_{it}(-2,.,-5) $\Delta m2_t$(-1,..,-5) Δg_{it}(-1,.,-5) Δr_{it}(-1,..,-5)	c_{it}(-2,.,-5) $\Delta m2_{it}$(-1,..,-5) $\Delta g2_{it}$(-1,.,-5) Δr_{it}(-1,..,-5)	c_{it}(-2,.,-5) Δm_{it}(-1,.-5) Δgg_{it}(-1,.-5) Δpp_{it}(-1,.-5) Δr_{it}(-1,..,-5)	c_{it}(-2,.,-5) Δm_{it}(-1,.-5) $\Delta gg2_{it}$(-1,.-5) Δpp_{it}(-1,.-5) Δr_{it}(-1,..,-5)

Legend: gg = public goods in volume; gg2= defence and public order spending in volume. The corresponding per capita variables are g and g2, respectively

Table 8: Private consumption and government consumption by type (GMM)

Eq.	$\Delta c_{i,t-1}$	Δhea_{it}	Δedu_{it}	$\Delta m2_{it}$	Δdef_{it}	Δpo_{it}	$\Delta g2_{it}$	Δpp_{it}	Δr_{it}	RSQ	INSTRUMENTS	LAG	J TEST
(1)	.557 (.171)	.134 (.078)	.278 (.112)		-.079 (.048)	-.144 (.088)				.387	$c_{i,t-2}...c_{i,t-4}$; $\Delta hea_{it-1}..\Delta hea_{it-4}$; $\Delta edu_{it-1}..\Delta edu_{it-4}$; $\Delta def_{it-1}..\Delta def_{it-4}$; $\Delta po_{it-1}..\Delta po_{it-4}$	4	J(14)=19.1 Pval=.160
(2)	.291 (.241)	.228 (.130)	.364 (.174)				-.281 (.100)			.320	$c_{i,t-2}...c_{i,t-4}$; $\Delta hea_{it-1}..\Delta hea_{it-4}$; $\Delta edu_{it-1}..\Delta edu_{it-4}$; $\Delta g2_{t-1}..\Delta pg2_{t-4}$	5	J(12)=16.4 Pval=.173
(3)	.348 (.122)	.217 (.047)	.335 (.101)		-.122 (.044)	-.139 (.107)		.114 (.246)		.230	$c_{i,t-2}...c_{i,t-4}$; $\Delta hea_{it-1}..\Delta hea_{it-4}$; $\Delta edu_{it-1}..\Delta edu_{it-4}$; $\Delta def_{it-1}..\Delta def_{it-4}$; $\Delta pp_{it-1}..\Delta pp_{it-4}$	4	J(17)=18.9 Pval=.332
(4)	.325 (.101)	.182 (.049)	.414 (.099)				-.240 (.072)	-.235 (.102)		.446	$c_{i,t-2}...c_{i,t-5}$; $\Delta hea_{it-1}..\Delta hea_{it-5}$; $\Delta edu_{it-1}..\Delta edu_{it-5}$; $\Delta g2_{t-1}..\Delta g2_{t-5}$; $\Delta pp_{it-1}..\Delta pp_{it-5}$	4	J(19)=19.4 Pval=.432
(5)	.439 (.106)	.232 (.051)	.193 (.089)		-.039 (.033)	-.154 (.058)			.653 (.142)	.404	$c_{i,t-2}...c_{i,t-5}$; $\Delta hea_{it-1}..\Delta hea_{it-4}$; $\Delta edu_{it-1}..\Delta edu_{it-4}$; $\Delta def_{it-1}..\Delta def_{it-4}$; $\Delta po_{it-1}..\Delta po_{it-4}$ $\Delta r_{it-1}\ldots\ \Delta r_{it-4}$	5	J(18)=16.5 Pval=.554
(6)	.322 (.121)			.500 (.156)	-.014 (.048)	-.159 (.075)			.845 (.164)	.376	$c_{i,t-2}...c_{i,t-5}$; $\Delta m2_{it-1}..\Delta m2_{it-4}$; $\Delta def_{it-1}..\Delta def_{it-4}$; $\Delta po_{it-1}..\Delta po_{it-4}$ $\Delta r_{it-1}\ldots\ \Delta r_{it-4}$	5	J(15)=14.8 Pval=.463
(7)	.274 (.060			.564 (.076)	-.030 (.020)	-.155 (.058)		-.115 (.073)	.719 (.122)	.441	$c_{i,t-2}...c_{i,t-5}$; $\Delta m2_{it-1}..\Delta m2_{it-4}$; $\Delta def_{it-1}..\Delta def_{it-4}$; $\Delta po_{it-1}..\Delta po_{it-4}$ $\Delta pp_{it-1}..\Delta pp_{it-4}$ $\Delta r_{it-1}\ldots\ \Delta r_{it-4}$	5	J(17)=15.0 Pval=.599

Legend: *hea* = health government consumption expenditure; *edu* = education government consumption expenditure; *def* = defense government consumption expenditure; *po* = public order and safety government consumption. All variables have been deflated by using the household consumption deflator.