The Relationship between Government and Private Consumption

A Replication Study of Fiorito & Kollintzas (*European Economic Review*, 2004)

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Data Availability: The data and STATA code to reproduce the results of this replication can be downloaded at JCRE's data archive (DOI: 10.15456/j1.2020282.083047).

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Abstract

This paper replicates the article Fiorito and Kollintzas (2004) "Public goods, merit goods, and the relationship between private and government consumption". The authors investigated whether government consumption crowds out private consumption by splitting government consumption into two categories: Public goods and merit goods. The authors develop a model of household spending behaviour in the presence of government spending. They then estimate the model using difference GMM applied to 12 OECD countries between 1970 to 1996. This study re-estimated their main model specifications by attempting to re-construct their data. I also extended the data sample to a more recent period (1996 to 2015). My replication confirmed their finding that merit goods and private consumption are complements. On the other hand, I did not find support for their conclusion that public goods and private consumption are substitutes.

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1 Introduction

Fiorito & Kollintzas' (F&K) paper "Public goods, merit goods, and the relationship between private and government consumption" (European Economic Review, 2004) investigated whether different branches of government consumption affect private consumption differently, and provided important theoretical and empirical evidence of the crowding out effect between government consumption and private consumption. This paper has received 39 citations according to Scopus and 183 according to Google Scholar as of September 2020.

F&K focused on the crowding out effect between government consumption and private consumption. They split government consumption into two categories: Public goods and merit goods. Public goods include defense, public order, and justice, which are difficult to supply privately. Merit goods include health, education, and other services that can be privately provided. The authors develop a model of household spending behavior in the presence of government spending. They then estimate the model using difference GMM applied to 12 OECD countries.

Their paper is motivated by the inconclusive evidence in the existing literature studying the response of economic aggregates to changes in government consumption composition. This response is dependent on whether government consumption can substitute for private consumption. Theoretically, their motivation comes from the fact that different types of government consumption may affect private consumption differently. For example, expenditures in public goods defense, public order and justice are typically the sectors that are difficult to be provided privately, while merit goods, which includes health and education services, may be easy for the private sector to gain access to due to the low entry barrier. So, the important differences in the very nature of these goods may lead to different responses in private consumption.

The findings of F&K suggested a substitution relationship between public goods and private consumption, and a complementary relationship between merit goods and private consumption. They further concluded that since the merit goods consumption is about two-thirds of government consumption, the aggregate government consumption complements private consumption.

This paper proceeds by presenting F&K's theoretical model and explains how it is put to data. I then present F&K's empirical findings along with my replication of their estimates. In the replication process, I first replicate their study using the same countries and time period (1970-1996), and then extend my replication to include more recent years (1996-2015). This paper contributes to the ongoing debate in public finance and the crowding out effect. Recent evidence in this field found a substitute relationship between private consumption and government consumption. (Dawood & Francois, 2018)

2 Theoretical Background and Model

F&K, building on Abel (1990) and Campbell & Cochrane (1999), construct a model of household consumption behaviour that incorporates habit formation, where the latter characteristic is designed to accommodate the observed effect of lagged variables on current consumption. Their model is based on the following assumptions:

1. The household's utility is dependent on current consumption as well as the household's "habit level."
2. The household's habit level is determined by the past consumption of all households in the economy.
3. The expectations of households regarding their future habit level are rational. In other words, along the steady-state equilibrium path, current consumption conditional on current habit levels must be consistent with past consumption.

The representative economic agent's preferences are characterized by the expectation of lifetime utility, represented by:

$$U = E_0 \sum_{t=0}^{\infty} \beta^t u(c_t, g_t, m_t, h_t^c, h_t^g, h_t^m) \tag{1}$$

In the above equation, E_0 is the expectation operator at time 0, β^t is a time-homogeneous time discount factor, $u(c_t, g_t, m_t, h_t^c, h_t^g, h_t^m)$ is a utility function based on the consumption of private goods, c_t, public goods, g_t, merit goods, m_t, and the current habit levels of the three kinds of consumption goods, h_t^c, h_t^g, and h_t^m.

For an individual household, its aim is to maximize expected lifetime utility subject to its budget constraint. The budget constraint assumes that the representative household, by giving up one unit of consumption in any period t, receives a stochastic real, gross, after tax return of R_{t+1} in the next period according to the Euler equation:

$$u_{c_t} = \beta E_t u_{c_{t+1}} R_{t+1} \tag{2}$$

The Euler equation states that people should be indifferent between consuming today and saving up and consuming in the future. The left-hand side of the equation represents the reward associated with consumption today, u_{c_t}. The right-hand side represents the reward of foregoing consumption today in order to save and enjoy consumption in the next period. If the consumer saves 1 unit today, he receives R_{t+1} consumption units in the next period, which produces $u_{c_{t+1}}$ units of utility at time period $t+1$. Because this utility comes in the future, it must be discounted by the factor β. This constitutes the right-hand side of the equation. The two sides of this equation must be equal to make sure that the consumer is indifferent between consuming today and consuming in the future.

The Euler condition may be used to illustrate the concept of substitutability/complementarity. Specifically, according to the Euler equation above, the right-hand side is the expected discounted benefit from one unit of assets invested in the current period. We can interpret it as the opportunity cost of consumption in this period.

Accordingly, the Euler equation can be interpreted as the demand for current private consumption. If private consumption and public goods consumption are substitutes (complements), an increase in public goods consumption lowers (increases) the demand for private consumption. This situation is depicted in Fig. 1 of F&K's paper which allows us to identify the relationship between private, public goods, and merit goods consumption. In particular, we can exploit the assumption of strict concavity of the utility function to identify these relationships as follows:

The Euler condition can be written as:

$$U = E_0[u_{c_t}(c_t, g_t, m_t, h_t^c, h_t^g, h_t^m) - \check{\beta} u_{c_{t+1}}(c_{t+1}, g_{t+1}, m_{t+1}, h_{t+1}^c, h_{t+1}^g, h_{t+1}^m)R_{t+1}] \tag{3}$$

F&K assume that the current habit levels of households are equal to the economy-average consumption levels of the previous period. As a result, we can write:

$$U = E_0[u_{c_t}(c_t, g_t, m_t, c_{t-1}, g_{t-1}, m_{t-1}) - \check{\beta} u_{c_{t+1}}(c_{t+1}, g_{t+1}, m_{t+1}, c_t, g_t, m_t)R_{t+1}] \tag{4}$$

F&K go on to show that the above can be expanded using a Taylor series, first-order approximation around the point (c, g, m, R) and that this leads to the following regression equation specification:

$$\Delta\check{c}_{t+1} = \alpha_1\Delta\check{g}_{t+1} + \alpha_2\Delta\check{m}_{t+1} + \alpha_3(\check{R}_{t+1} - \check{R}) + \alpha_4\Delta\check{c}_t + \alpha_5\Delta\check{g}_t + \alpha_6\Delta\check{m}_t + \varepsilon_{t+1}. \tag{5}$$

In the above equation, Δ stands for the difference operator, the hatschek ˇ indicates that the natural logarithm of the variable is taken, $E(\varepsilon_{t+1}) = 0$, and the respective slope coefficients are defined as follows:

$$\alpha_1 = -u_{cg}g/u_{cc}c,$$

$$\alpha_2 = -u_{cm}m/u_{cc}c,$$

$$\alpha_3 = -\check{\beta}u_c/u_{cc}c,$$

$$\alpha_4, \alpha_5, \alpha_6 = -u_{ch}/u_{cc}, h = h^c, h^g, h^m;$$

wherein $u_c = \delta_u/\delta_c, u_{cc} = \delta^2 u/\delta c^2$, and $u_{cg} = \delta^2 u/\delta c\delta g$, etc. Because u_{cc} must be strictly negative according to the concavity of the utility function, the signs of α_1 and α_2 depend completely on u_{cg} and u_{cm}. This leads to the following corollary.

<u>COROLLARY 1:</u>

If u is strictly concave in c; c and $g(m)$ are substitutes, if and only if

$$\alpha_1 < 0 \ \ (\alpha_2 < 0).$$

They are independent if

$$\alpha_1 = 0 \ \ (\alpha_2 = 0).$$

And they are complements if

$$\alpha_1 > 0 \ \ (\alpha_2 > 0).$$

According to this corollary, it is straightforward to identify the relationship between private consumption and the two types of government spending from the signs of the coefficients on the contemporaneous government spending variables from the estimation of Equation (5). Further, because the variables are measured in logs, the respective coefficients can be interpreted as elasticities.

The subsequent empirical analysis will focus on these two coefficients. In particular, we will use the signs of these coefficients to identify the complementarity or substitutability between private consumption and the two different types of government spending.

F&K's model also yields confirmatory checks on the underlying theory, which derives from the permanent income model with external habit formation. These checks are covered by the following corollary.

COROLLARY 2:

(1) If u is a strictly increasing and strictly concave in c, then $\alpha_3 > 0$.

(2) If there is external habit formation in private consumption, $\alpha_4 > 0$.

3 Estimation Model

F&K use dynamic panel estimation to estimate Equation (6), which is simply Equation (5) with the time periods backed up one period:

$$\begin{aligned}\Delta\check{c}_t &= \alpha_1\Delta\check{g}_t + \alpha_2\Delta\check{m}_t + \alpha_3(\check{R}_t - \check{R}_{t-1}) + \alpha_4\Delta\check{c}_{t-1} + \alpha_5\Delta\check{g}_{t-1} \\ &\quad + \alpha_6\Delta\check{m}_{t-1} + \alpha_7\Delta d_t + \varepsilon_t\end{aligned} \tag{6}$$

After they show the estimation results for Equation (6), they add an additional variable to control for income.

$$\begin{aligned}\Delta\check{c}_t &= \alpha_1\Delta\check{g}_t + \alpha_2\Delta\check{m}_t + \alpha_3(\check{R}_t - \check{R}_{t-1}) + \alpha_4\Delta\check{c}_{t-1} + \alpha_5\Delta\check{g}_{t-1} \\ &\quad + \alpha_6\Delta\check{m}_{t-1} + \alpha_7\Delta d_t + \alpha_8\Delta yd_t + \alpha_9\Delta yd_t + \varepsilon_t\end{aligned} \tag{7}$$

$\Delta\check{c}$, $\Delta\check{g}$, and $\Delta\check{m}$ have all been previously defined. d_t is the working-age population share, $\check{R}$ is the logarithm of the after tax, real interest rate, and yd is household disposable income.

Working-age population share is a preference shifter accounting for the possibility that the relationship between government consumption and private consumption might be affected by demographic factors. F&K define the after tax, real interest rate as:

$$r_{it} = ln\left(\frac{1 + \left((1 - tauc) * (irs_{it}/100)\right)}{pc_{it}/pc_{it-1}}\right) \tag{8}$$

where pc is the household consumption deflator, irs is the short-run interest rate, and $tauc$ is the effective tax rate on consumption as calculated as in Fiorito & Padrini (2001).

The authors used difference GMM, with past level values of the private consumption variable and past differenced values of the right-hand side explanatory variables as instruments. In addition, they employed the Newey-West robust covariance estimator for the associated weighting matrix to address both heteroskedasticity and serial correlation.

4 Data

In the original paper, the authors used a balanced panel dataset for 12 OECD countries, namely Austria, Denmark, Finland, France, Germany, Greece, Italy, Norway, Portugal, Spain, Sweden, and the United Kingdom, between 1970 and 1996. The data used for regression were drawn from the following OECD databases:

1) National Accounts (1999), 1.1 Main Aggregates (vol.1)

2) National Accounts (1999), 1.2 Detailed Tables (vol.2)

3) Economic Outlook.

In the first part of my replication study, I tried to recreate their main finding and estimation results by adopting the same dataset that they used. I first tried to contact the authors and asked them if they still had the original dataset. Unfortunately, they were unable to provide me with the data as they didn't have it anymore.

The authors did provide a statistics appendix at the end of their paper detailing the sources they used for data collection. I found the majority of the data at online databases, but there were many missing observations.

More than half of the countries had missing data between 1970 and 1980, as well as 1996[1]. These data were not available in the online database of the OECD National Account Database[2]. I contacted the staff working for the database, however, they were unable to produce the missing data. Further, they were unable to provide any explanations for why the data were missing. On the plus side, they did mention that I might have success finding the data in extant book copies of the vintage datasets published decades ago.

Accordingly, I began searching for printed book copies of the data. After contacting several different sources, I was able to find one book copy of the database at the Western Washington University Library, and two book copies at the University of Auckland. I had these shipped to me using the University of Canterbury interloan system. These enabled me to fill in some of the gaps in my database.

Unfortunately, I was not able to re-construct the full dataset for all countries and all years. In the end, I found data for approximately 80% of the observations. This resulted in my estimation results being similar, but still somewhat different, from the original paper, as I will show in the following paragraphs.

F&K's dataset used observations from 1970 and 1996. As part of my replication study, I extended their study by updating the time span of this data set to 2015, which was the most recently available year documented by the National Accounts database (OECD, 2018) at the time of the data collection.

[1] For many countries data for 1996 is documented in euro, not the original currency. More details can be found further down in this section.

[2] The online OECD National Accounts Statistics are provided by the OECD iLibrary: `doi.org/10.1787/na-data-en`.

In categorizing the different types of government spending, I follow F&K who, in turn, rely on the United Nations Classification of the Functions of Government (COFOG) spending categories. The COFOG classification consists of 10 spending categories:

1) General public services
2) Defence
3) Public order and safety
4) Economic affairs
5) Environmental protection
6) Housing and community amenities
7) Health
8) Recreation, culture and religion
9) Education
10) Social protection

In their main specifications, F&K defined public goods as the sum of 1, 2, and 3; and merit goods as the sum of Items 6-10. Subsequent robustness checks considered modifications to these groupings.

F&K provided some descriptive statistics in Table 4 of their original paper. I updated their table using data from 2015 (OECD, 2018), the results are listed in Table 1. Table 1 indicated that, there haven't been major changes in the spending composition between 1995 and 2015. Public goods still take up a relatively small share of government spending, and most of the spending increase in public goods is associated with general public service. However, the increase in spending for merit goods is in general small.

It is worth noticing that during this time, some changes occurred with the data documented in the National Account database.

The database gradually converted from the old 1968 System of National Accounts (SNA) to the 2008 SNA. The original, vintage data only reported data following the 1968 SNA. More recent data only reported data following the 2008 SNA. Data in the "middle" reported both. To address this problem, I collected data according to the 1968 SNA for the 1970 to 1996 dataset (matching F&K). For the more recent data (1996-2015), I used data that exclusively followed the 2008 SNA, which is the only consistent SNA available.

In addition, several countries in my dataset joined the Eurozone in the 1990s. This resulted in a shift in currency for these countries. For example, government spending datasets according to the COFOG classification for France are denominated in francs before 1996 according to the 1968 SNA system, but denominated in Euros according to the 2008 SNA system from 1996 onwards. I deal with this problem by keeping the two datasets separate (1970-1996, 1996-2015), using the

Table 1: The structure of general government expenditure in 2015, GDP shares [%] – Update on F&K's Table 4

	Denmark	France	Germany	Italy	Norway	Portugal	Spain	United Kingdom
Total	54.5	56.8	44.1	50.3	49.3	48.2	43.9	42.3
General Public Services	7.4	6.3	5.9	8.6	4.7	8.8	6.5	4.5
Defence	1.1	1.8	1.0	1.2	1.5	1.0	1.0	2.0
Public Order and Safety	1.0	1.6	1.5	1.9	1.1	1.9	2.0	1.9
Education	7.0	5.4	4.2	4.0	5.5	5.1	4.1	5.2
Health	8.5	8.1	7.2	7.0	8.2	6.2	6.2	7.5
Housing and Community Amenities	0.2	1.1	0.4	0.5	0.8	0.5	0.5	0.7
Recreation, Culture and Religion	1.8	1.4	1.0	0.7	1.6	0.8	1.2	0.7
Social Protection	23.5	24.3	19.1	21.3	19.5	18.5	17.2	16.0
Economic Affairs	3.6	5.7	3.2	4.3	5.4	4.9	4.4	3.1
Environment Protection	0.4	1.0	0.6	0.9	0.9	0.6	0.9	0.8

Source: National Accounts Database (OECD, 2018)

respective currency for each time period. The latter data are reserved for my "extension analysis". Note that because of this shift in the SNA system, for many countries the data for 1996 is no longer documented in their original currency, therefore there are missing data for 1996 in the first dataset. However, this is not a problem for the second dataset. In addition, keeping the two datasets separate also allows for the comparison of the period F&K used with the more recent period.

My final dataset for government spending includes data for Austria, Denmark, Finland, France, Germany, Greece, Italy, Norway, Portugal, Spain, Sweden, and the United Kingdom for the years 1970-2015. Although due to the reasons above, there are missing data for the 1970 to 1996 dataset, while there is no missing value in the government spending data for 1996-2015. (Note that although I do not have missing data in government spending between 1996 to 2015, I do have 12 missing values when constructing after tax, real interest rate.)

Working age population share and other data used to construct the after tax, real interest rate variable are collected using the OECD Economic Outlook database. All of the deflators used in my datasets are taken from National Accounts databases.

With respect to replicating F&K, I was able to assemble 232 observations. While F&K do not report their total number of observations, if their data are balanced, as they say, they should have used 300 observations in their estimations. (12 countries and 27 time periods, taking into account the differenced estimation equation and lagged values.) In my subsequent "extension analysis", I use 196 observations.

Another issue I faced concerned the deflation of government expenditures. Government expenditure by function data from OECD sources is nominal data. Further, OECD sources do not report separate deflators for public goods and merit goods; only aggregate government and household consumption deflators. I followed the authors' procedures when stated. When no guidance was available, I estimated alternative versions using different deflators.

Table 2: Variables used by F&K and my replication study

Variable	Definition
C	Per capita household consumption in real terms
m	Merit goods 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 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)
yd	Logged per capita household disposable income in real terms (household consumption deflator)
d	Working age population share
r	After tax real interest rate

Source: Working age population share is from the Economic Outlook Database (OECD, 2016). After tax real interest rate is calculated using data from the OECD economic outlook database. All other variables are from the National Accounts Database (OECD, 2018).

A conceptual issue in taking F&K's model to data was matching the COFOG functional classifications to the concepts of public goods and merit goods. I followed the authors' approach to this problem. They defined "wider" and "smaller" variables, where only well-defined spending categories were included in the "smaller" public goods and merit goods categories. The "smaller" public goods variable included only public order and defence expenditures. The "smaller" merit goods variable included only education and health expenditures. Table 2 summarizes the variables used in F&K and my corresponding replication study.

5 *Results*

In recreating F&K's results, I attempted to reproduce not only their data, but also their empirical procedures. F&K reported that they used difference GMM, with differenced values from past periods serving as instruments. In the main estimation results in their original Table 5, they first estimated Equation (6) without household income. In their estimation results for Equation (7), they added an additional variable to control for household income.

F&K did not mention the specific estimation commands they used to produce their results. My first attempt to reproduce their results used Stata's built-in GMM procedure, *xtabond*. However, the *xtabond* command does not allow lagged differenced variables to be used as instruments, and F&K specifically state that they used both lagged level and lagged differenced variables.

I next used Stata's *xtabond2* procedure, which did allow me to use both lagged level and differenced variables as instruments. Using a "collapse" option that limits the number of instruments used in the estimation, I was able to produce results very similar to what F&K reported. Further, the associated number of instruments and over-identifying restrictions matched the numbers reported in F&K's tables.

Tables 3 through 8 below report the results of my replication analysis. The difference between the results shown in Tables 3 to 5 and the results in Tables 6 to 8 is that the regression results in Tables 6 to 8 are augmented by household disposable income yd. Column 1 reports F&K's estimates; Column 2 reports my replication of their results using data for the years 1970-1996 – the same year included in F&K's study; and Column 3 shows the estimation of the same specification using data for the years 1996-2015. While F&K estimate many specifications, Table 5 in their article contains their main results; and Columns 2, 3, and 5 contain the main results from that table. These are the results I focus on in my Tables 3 through 8. Note that these results excerpt estimates from the full set of results. The full set of estimates are reported in Tables 9 through 14 in the Appendix, where Table 9 and 12 is F&K's results, Table 10 and 13 is the result I get by using the data I gathered according to their specification and time period, Table 11 and 14 is the "extension" part of the analysis where I use their model specification and adopted data between 1996 and 2015. The difference between Tables 9 to 11 and Tables 12 to 14 is that the latter are augmented by household disposable income yd.

From the perspective of determining whether merit goods (m) and public goods (g) are substitutes or complements for private consumption, the key parameters are α_2 and α_1 in Equation (6), the estimates corresponding to these parameters are in bold in Table 3-8 respectively. F&K conclude that merit goods are complements to private consumption, and public goods are substitutes. They base this conclusion on their finding that the signs of the coefficients for α_2 and α_1 are consistently positive and negative, respectively. Interestingly, they do not comment on the fact that the estimated coefficient for the public goods variable, α_1, is generally statistically insignificant.

Column 1 of Tables 3 through 8 reproduce F&K's estimates. The tables differ in that they vary the composition of government spending categories used to create the aggregate spending variables for merit goods (m) and public goods (g). Tables 3 and 6 show the estimation results for $m1$ and $g1$. The alternative variables are respectively identified as $m2$ (cf. Table 4 and 7) and $g2$ (cf. Table 5 and 8). The bold cells in the tables correspond to the estimates of α_2 and α_1. In addition, the J-test across the tables suggest that the instruments used are validly exogenous.

With respect to merit goods (m), F&K report estimates for α_2 of 0.498, 0.504, and 0.610 in Tables 3-5, respectively. When they add income, they obtain estimates of 0.534, 0.554, and 0.661 (cf. Tables 6-8). All estimates are significant at the 5 percent level. The coefficients can be interpreted as indicating that a one percent increase in merit good production by the public sector increases private consumption by approximately 0.5 to 0.6 percent.

Using the data I collected for the same time period as F&K (1970-1996), I obtained corresponding estimates of 0.535, 0.426, and 0.490, and estimates of 0.471, 0.388, and 0.477 when controlled for income. While my point estimates are similar to F&K's, they are generally less significant than what F&K report. None are significant at the 1 percent level when not controlling for income. Instead, the results are significant at the 10 percent level, insignificant, and significant at the 5 percent level, respectively. However, I did get more significant results after augmenting for income.

A stronger result is obtained when I replicate F&K using new data from 1996-2015, the results are shown in Column 3 in Tables 3-8. For these data, the corresponding estimates for α_2 are 0.516,

0.442, and 0.447. When I control for income, the corresponding estimates for α_2 are 0.357, 0.386 and 0.373. All estimates are significant at the 1 percent level.

Taken together, I interpret these results as providing strong evidence in confirmation of F&K's findings that merit goods and private consumption are complementary. In other words, government spending on education, health, and related goods that can in principle be supplied by the private sector, serve to stimulate private spending in the same areas.

Turning now to public goods (g), we see that F&K produced estimates of α_1 of -0.067, -0.062, and 0.055. After controlling for income, they reported estimates of -0.123, 0.012, and -0.029. These elasticities are very small. In all cases, a one percent increase in public good spending is estimated to produce less than a 0.1 percent change in absolute value in private consumption. Further, none of the estimates are significant at the 10 percent level. Given this, it is difficult to understand how F&K could have concluded that public goods are substitutes for private consumption. The results indicate, instead, that public goods and private goods are not substitutes (cf. Corollary 1).

My replication results for both the 1970-1996 and 1996-2015 data confirm the independence of private and public goods consumption. I obtain estimates that range from -0.106 to 0.129, in all six instances before controlling for income, and estimates ranging from -0.010 and 0.088 afterwards. The estimates are statistically insignificant at the 10 percent level, therefore I cannot reject the null hypothesis that public and private goods consumption are independent.

In summary, my results confirm F&K's empirical estimates on public goods, my interpretation of the results are different from F&K. While they conclude that public goods and private consumption are substitutes, my replication of their results, and indeed, their own results, cannot reject the independence of public and private goods consumption. Furthermore, my interpretation is confirmed by my replication results using the new dataset between 1996-2015.

Overall, I interpret my replication as confirming F&K. I find this all the more impressive in that I get results very close to what F&K obtain even when I use entirely new data from more recent years. The empirical results are consistent with the interpretation that merit goods and private consumption are complements, while I did not find any evidence to indicate that public goods and private consumption are substitutes.

6 *Conclusion*

This study replicated F&K (2004) and extended their analysis by adopting more recent data. By gathering data using the statistical appendix they provided, I am able to match their specification and produce very similar results compared with their original study. I further confirmed their results by running their model specification using more recent data.

F&K concluded that there exists a complementary relationship between "merit good" consumption and private consumption, and a substitutionary relationship between "public good" consumption and private consumption. My replication results confirmed their empirical estimates for both

Table 3: Replication of Column 2, Table 5 from F&K

Variables	F&K	Replication (1970-1996)	Replication (1996-2015)
$\Delta c_{i,t-1}$	0.773***	0.827***	0.843***
	(0.11)	(0.129)	(0.154)
$\Delta m_{i,t}$	**0.498*** **	**0.535* **	**0.517*** **
	(0.063)	**(0.306)**	**(0.090)**
$\Delta m_{i,t-1}$	−0.277***	−0.437*	−0.430***
	(0.048)	(0.256)	(0.117)
$\Delta g_{i,t}$	**−0.067**	**0.055**	**−0.106**
	(0.063)	**(0.199)**	**(0.097)**
$\Delta g_{i,t-1}$	−0.093**	−0.049	−0.011
	(0.038)	(0.171)	(0.075)
$\Delta d_{i,t}$	−0.375***	0.336	−0.420
	(0.134)	(0.316)	(0.410)
$\Delta r_{i,t}$	0.082	0.011	−0.005
	(0.193)	(0.012)	(0.006)
J-test	$\chi^2(15) = 15.3$	$\chi^2(15) = 7.14$	$\chi^2(15) = 8.55$
	$P = 0.426$	$P = 0.954$	$P = 0.900$
Observations	300	232	196

Table 3 reports the results from estimating equation (6). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 denote two-sided significance levels. The bold cells highlight the main variables of interest. They correspond to the estimated coefficients for merit goods (m) and public goods (g). Note that although F&K did not report the number of observations they used in their analysis, they should have 300 observations in their estimations if they indeed had a balanced panel dataset.

"merit good" and "public good" consumption when using the same data and specification as they did in their original paper, and when using more recent data between 1996 and 2015.

However, my replication identified a discrepancy in F&K's interpretation of their own results. While they correctly interpreted the empirical results for "merit good" consumption, the interpretation of their "public good" consumption results was inconsistent with their estimates. F&K estimate, and my replication confirms, a small and statistically insignificant relationship between public good consumption and private consumption. This indicates that public goods consumption and private consumption are not substitutes, as F&K conclude.

These results confirm that government spending tends to affect private consumption differently depending on the composition of government expenditure. As a result, policy-makers should account for the different responses of different kinds of government spending when making fiscal decisions.

Table 4: Replication of Column 3, Table 5 from F&K

Variables	F&K	Replication (1970-1996)	Replication (1996-2015)
$\Delta c_{i,t-1}$	0.464***	0.693***	1.001***
	(0.127)	(0.171)	(0.257)
$\Delta m2_{i,t}$	**0.504*** **	**0.426**	**0.442*** **
	(0.081)	**(0.286)**	**(0.140)**
$\Delta m2_{i,t-1}$	−0.01	−0.253	−0.407***
	(0.066)	(0.231)	(0.064)
$\Delta g_{i,t}$	**−0.062**	**0.129**	**−0.085**
	(0.088)	**(0.249)**	**(0.093)**
$\Delta g_{i,t-1}$	−0.248***	−0.106	−0.104
	(0.062)	(0.233)	(0.121)
$\Delta d_{i,t}$	−0.218*	−0.112	−0.551
	(0.124)	(0.317)	(0.435)
$\Delta r_{i,t}$	0.139	0.020	−0.007
	(0.173)	(0.012)	(0.007)
J-test	$\chi^2(13) = 11.4$	$\chi^2(13) = 6.06$	$\chi^2(13) = 2.51$
	$P = 0.575$	$P = 0.944$	$P = 0.990$
Observations	300	232	196

Table 4 reports the results from estimating equation (6). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 denote two-sided significance levels. The bold cells highlight the main variables of interest. They correspond to the estimated coefficients for merit goods (m) and public goods (g). Note that although F&K did not report the number of observations they used in their analysis, they should have 300 observations in their estimations if they indeed had a balanced panel dataset.

Table 5: Replication of Column 6, Table 5 from F&K

Variables	F&K	Replication (1970-1996)	Replication (1996-2015)
$\Delta c_{i,t-1}$	0.543***	0.870***	0.880***
	(0.144)	(0.112)	(0.190)
$\Delta m_{i,t}$	**0.610*** **	**0.488** **	**0.448*** **
	(0.082)	**(0.246)**	**(0.170)**
$\Delta m_{i,t-1}$	−0.359***	−0.411**	−0.372*
	(0.103)	(0.193)	(0.194)
$\Delta g2_{i,t}$	**0.011**	**0.042**	**−0.090**
	(0.073)	**(0.123)**	**(0.115)**
$\Delta g2_{i,t-1}$	0.055	−0.037	−0.073
	(0.047)	(0.105)	(0.164)
$\Delta d_{i,t}$	−0.203*	0.280	−0.137
	(0.115)	(0.388)	(0.476)
$\Delta r_{i,t}$	0.428*	0.012	−0.006
	(0.229)	(0.010)	(0.006)
J-test	$\chi^2(13) = 11.7$	$\chi^2(13) = 6.55$	$\chi^2(13) = 3.98$
	$P = 0.548$	$P = 0.924$	$P = 0.991$
Observations	300	232	196

Table 5 reports the results from estimating equation (6). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 denote two-sided significance levels. The bold cells highlight the main variables of interest. They correspond to the estimated coefficients for merit goods (m) and public goods (g). Note that although F&K did not report the number of observations they used in their analysis, they should have 300 observations in their estimations if they indeed had a balanced panel dataset.

Table 6: Replication of Column 2, Table 5 augmented by disposable income, F&K

Variables	F&K	Replication (1970-1996)	Replication (1996-2015)
$\Delta c_{i,t-1}$	0.530***	0.908***	0.743**
	(0.142)	(0.083)	(0.289)
$\Delta m_{i,t}$	**0.534*** **	**0.471*** **	**0.357** **
	(0.115)	**(0.082)**	**(0.141)**
$\Delta m_{i,t-1}$	−0.239*	−0.416***	−0.248***
	(0.146)	(0.092)	(0.052)
$\Delta g_{i,t}$	**−0.123**	**0.082**	**0.024**
	(0.095)	**(0.129)**	**(0.143)**
$\Delta g_{i,t-1}$	0.057	−0.090	−0.084
	(0.066)	(0.130)	(0.072)
$\Delta yd_{i,t}$	0.453**	0.562***	0.413**
	(0.210)	(0.164)	(0.207)
$\Delta yd_{i,t-1}$	−0.340	−0.106	−0.022
	(0.208)	(0.125)	(0.052)
$\Delta d_{i,t}$	−0.239	0.425	−0.465
	(0.156)	(0.449)	(0.421)
$\Delta r_{i,t}$	0.054	−0.006	−0.013**
	(0.292)	(0.010)	(0.006)
J-test	$\chi^2(11) = 11.3$	$\chi^2(11) = 3.84$	$\chi^2(11) = 3.17$
	$P = 0.418$	$P = 0.974$	$P = 0.988$
Observations	300	225	185

Table 6 reports the results from estimating equation (6). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 denote two-sided significance levels. The bold cells highlight the main variables of interest. They correspond to the estimated coefficients for merit goods (m) and public goods (g). Note that although F&K did not report the number of observations they used in their analysis, they should have 300 observations in their estimations if they indeed had a balanced panel dataset.

Table 7: Replication of Column 3, Table 5 augmented by disposable income, F&K

Variables	F&K	Replication (1970-1996)	Replication (1996-2015)
$\Delta c_{i,t-1}$	0.633***	0.945***	0.688***
	(0.193)	(0.143)	(0.248)
$\Delta m2_{i,t}$	**0.554*** **	**0.388*** **	**0.386*** **
	(0.105)	**(0.121)**	**(0.143)**
$\Delta m2_{i,t-1}$	−0.311*	−0.350***	−0.265***
	(0.141)	(0.087)	(0.077)
$\Delta g_{i,t}$	**0.012**	**0.088**	**−0.010**
	(0.115)	**(0.121)**	**(0.158)**
$\Delta g_{i,t-1}$	0.063	−0.105	−0.005
	(0.068)	(0.136)	(0.036)
$\Delta yd_{i,t}$	0.309	0.383***	0.389**
	(0.211)	(0.141)	(0.154)
$\Delta yd_{i,t-1}$	−0.403*	0.008	0.005
	(0.222)	(0.138)	(0.031)
$\Delta d_{i,t}$	−0.179*	0.497	−0.422
	(0.124)	(0.399)	(0.417)
$\Delta r_{i,t}$	0.374	0.001	−0.010*
	(0.284)	(0.009)	(0.006)
J-test	$\chi^2(13) = 9.4$	$\chi^2(13) = 2.54$	$\chi^2(13) = 3.11$
	$P = 0.581$	$P = 0.999$	$P = 0.997$
Observations	300	225	185

Table 7 reports the results from estimating equation (6). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 denote two-sided significance levels. The bold cells highlight the main variables of interest. They correspond to the estimated coefficients for merit goods (m) and public goods (g). Note that although F&K did not report the number of observations they used in their analysis, they should have 300 observations in their estimations if they indeed had a balanced panel dataset.

Table 8: Replication of Column 6, Table 5 augmented by disposable income, F&K

Variables	F&K	Replication (1970-1996)	Replication (1996-2015)
$\Delta c_{i,t-1}$	0.513***	0.961***	0.719***
	(0.134)	(0.077)	(0.205)
$\Delta m_{i,t}$	**0.661*** **	**0.477*** **	**0.373*** **
	(0.154)	**(0.105)**	**(0.106)**
$\Delta m_{i,t-1}$	−0.365***	−0.450***	−0.255**
	(0.130)	(0.111)	(0.122)
$\Delta g2_{i,t}$	**−0.029**	**0.040**	**0.019**
	(0.078)	**(0.095)**	**(0.150)**
$\Delta g2_{i,t-1}$	0.101	−0.064	−0.057
	(0.068)	(0.086)	(0.087)
$\Delta yd_{i,t}$	0.220	0.398**	0.398***
	(0.270)	(0.169)	(0.130)
$\Delta yd_{i,t-1}$	−0.252	−0.019	0.008
	(0.226)	(0.155)	(0.057)
$\Delta d_{i,t}$	−0.215*	0.633	−0.270
	(0.128)	(0.487)	(0.543)
$\Delta r_{i,t}$	0.199	−0.002	−0.010*
	(0.300)	(0.006)	(0.006)
J-test	$\chi^2(13) = 9.7$	$\chi^2(13) = 2.27$	$\chi^2(13) = 1.43$
	$P = 0.553$	$P = 1.000$	$P = 1.000$
Observations	300	225	185

Table 8 reports the results from estimating equation (6). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 denote two-sided significance levels. The bold cells highlight the main variables of interest. They correspond to the estimated coefficients for merit goods (m) and public goods (g). Note that although F&K did not report the number of observations they used in their analysis, they should have 300 observations in their estimations if they indeed had a balanced panel dataset.

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Appendix

Table 9: Original results of F&K in their Table 5

Equation	1	2	3	4	5	6	7
$\Delta c_{i,t-1}$	0.675***	0.773***	0.464***	0.412***	0.544***	0.543***	0.498***
	(0.175)	(0.11)	(0.127)	(0.135)	(0.139)	(0.144)	(0.11)
$\Delta m_{i,t}$	0.353***	0.498***			0.58***	0.61***	
	(0.123)	(0.063)			(0.081)	(0.082)	
$\Delta m_{i,t-1}$	−0.103	−0.277***			−0.336***	−0.359***	
	(0.084)	(0.048)			(0.082)	(0.103)	
$\Delta m2_{i,t}$			0.504***	0.704***			0.537***
			(0.081)	(0.136)			(0.093)
$\Delta m2_{i,t-1}$			−0.01	−0.377***			−0.257***
			(0.066)	(0.129)			(0.094)
$\Delta g_{i,t}$	−0.102	−0.067	−0.062				
	(0.08)	(0.063)	(0.088)				
$\Delta g_{i,t-1}$	−0.078	−0.093**	−0.248***				
	(0.065)	(0.038)	(0.062)				
$\Delta g2_{i,t}$				0.028		0.011	
				(0.098)		(0.073)	
$\Delta g2_{i,t-1}$				0.06		0.055	
				(0.065)		(0.047)	
$\Delta g3_{i,t}$					0.059		0.06
					(0.11)		(0.092)
$\Delta g3_{i,t-1}$					0.064		0.02
					(0.057)		(0.051)
$\Delta d_{i,t}$		−0.375***	−0.218*	−0.181	−0.148	−0.203*	−0.225**
		(0.134)	(0.124)	(0.137)	(0.099)	(0.115)	(0.102)
$\Delta r_{i,t}$	0.284	0.082	0.139	0.804***	0.389*	0.428*	0.613***
	(0.234)	(0.193)	(0.173)	(0.221)	(0.233)	(0.229)	(0.19)
J-test	$\chi^2(11) = 13.6$	$\chi^2(15) = 15.3$	$\chi^2(13) = 11.4$	$\chi^2(10) = 9.2$	$\chi^2(13) = 11.5$	$\chi^2(13) = 11.7$	$\chi^2(13) = 13.5$
	$P = 0.253$	$P = 0.426$	$P = 0.575$	$P = 0.513$	$P = 0.57$	$P = 0.548$	$P = 0.413$
Observations	300	300	300	300	300	300	300

Table 9 reports the results from estimating Equation (6). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 are two-sided significance levels. Note that although F&K did not report the number of observations they used in their analysis, they should have 300 observations in their estimations if they indeed had a balanced panel dataset.

Table 10: Replication (1970-1996) results of F&K's Table 5

Equation	1	2	3	4	5	6	7
$\Delta c_{i,t-1}$	0.990***	0.827***	0.693***	0.809***	0.926***	0.870***	0.847***
	(0.273)	(0.129)	(0.171)	(0.155)	(0.141)	(0.112)	(0.183)
$\Delta m_{i,t}$	0.138	0.535*			0.536**	0.488**	
	(0.285)	(0.306)			(0.270)	(0.246)	
$\Delta m_{i,t-1}$	−0.122	−0.437*			−0.476**	−0.411**	
	(0.299)	(0.256)			(0.234)	(0.193)	
$\Delta m2_{i,t}$			0.426	0.392*			0.502*
			(0.286)	(0.203)			(0.259)
$\Delta m2_{i,t-1}$			−0.253	−0.280*			−0.397*
			(0.231)	(0.148)			(0.228)
$\Delta g_{i,t}$	0.088	0.055	0.129				
	(0.268)	(0.199)	(0.249)				
$\Delta g_{i,t-1}$	−0.074	−0.049	−0.106				
	(0.237)	(0.171)	(0.233)				
$\Delta g2_{i,t}$				0.122		0.042	
				(0.105)		(0.123)	
$\Delta g2_{i,t-1}$				−0.112		−0.037	
				(0.101)		(0.105)	
$\Delta g3_{i,t}$					−0.018		0.017
					(0.150)		(0.153)
$\Delta g3_{i,t-1}$					0.001		−0.029
					(0.113)		(0.115)
$\Delta d_{i,t}$		0.336	−0.112	0.012	0.465	0.280	0.167
		(0.316)	(0.317)	(0.318)	(0.576)	(0.388)	(0.544)
$\Delta r_{i,t}$	0.021**	0.011	0.020	0.015	0.013	0.012	0.017
	(0.009)	(0.012)	(0.012)	(0.014)	(0.010)	(0.010)	(0.014)
J-test	$\chi^2(11) = 5.48$	$\chi^2(15) = 7.14$	$\chi^2(13) = 6.06$	$\chi^2(10) = 4.42$	$\chi^2(13) = 2.46$	$\chi^2(13) = 6.55$	$\chi^2(13) = 6.35$
	$P = 0.906$	$P = 0.954$	$P = 0.944$	$P = 0.926$	$P = 0.999$	$P = 0.924$	$P = 0.933$
Observations	232	232	232	232	232	232	232

Table 10 reports the results from estimating Equation (6). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 are two-sided significance levels.

Table 11: Replication (1996-2015) results of F&K's Table 5

Equation	1	2	3	4	5	6	7
$\Delta c_{i,t-1}$	1.038***	0.843***	1.001***	0.574**	1.140***	0.880***	1.057***
	(0.238)	(0.154)	(0.257)	(0.279)	(0.243)	(0.190)	(0.251)
$\Delta m_{i,t}$	0.523***	0.517***			0.061	0.448***	
	(0.182)	(0.090)			(0.273)	(0.170)	
$\Delta m_{i,t-1}$	−0.580***	−0.430***			−0.126	−0.372*	
	(0.084)	(0.117)			(0.261)	(0.194)	
$\Delta m2_{i,t}$			0.442***	0.623**			0.162
			(0.140)	(0.291)			(0.256)
$\Delta m2_{i,t-1}$			−0.407***	−0.541*			−0.192
			(0.064)	(0.311)			(0.208)
$\Delta g_{i,t}$	−0.047	−0.106	−0.085				
	(0.103)	(0.097)	(0.093)				
$\Delta g_{i,t-1}$	0.040	−0.011	−0.104				
	(0.100)	(0.075)	(0.121)				
$\Delta g2_{i,t}$				0.035		−0.090	
				(0.119)		(0.115)	
$\Delta g2_{i,t-1}$				0.133		−0.073	
				(0.314)		(0.164)	
$\Delta g3_{i,t}$					−0.100		−0.103
					(0.076)		(0.078)
$\Delta g3_{i,t-1}$					−0.254**		−0.178
					(0.113)		(0.150)
$\Delta d_{i,t}$		−0.420	−0.551	−0.782	−0.396	−0.137	−0.330
		(0.410)	(0.435)	(0.754)	(0.348)	(0.476)	(0.249)
$\Delta r_{i,t}$	−0.002	−0.005	−0.007	−0.009*	0.003	−0.006	0.002
	(0.004)	(0.006)	(0.007)	(0.005)	(0.007)	(0.006)	(0.006)
J-test $\chi^2(11) = 7.93$	$\chi^2(15) = 8.55$	$\chi^2(13) = 2.51$	$\chi^2(10) = 2.33$	$\chi^2(13) = 4.86$	$\chi^2(13) = 3.98$	$\chi^2(13) = 5.65$	
	$P = 0.72$	$P = 0.900$	$P = 0.999$	$P = 0.993$	$P = 0.978$	$P = 0.991$	$P = 0.958$
Observations	196	196	196	196	196	196	196

Table 11 reports the results from estimating Equation (6). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 are two-sided significance levels.

Table 12: Original results of F&K in their Table 5, augmented by disposable income

Equation	1	2	3	4	5	6	7
$\Delta c_{i,t-1}$	0.776***	0.530***	0.633***	0.477***	0.493***	0.513***	0.446***
	(0.242)	(0.142)	(0.193)	(0.123)	(0.161)	(0.134)	(0.118)
$\Delta m_{i,t}$	0.507**	0.534***			0.649***	0.661***	
	(0.226)	(0.115)			(0.129)	(0.154)	
$\Delta m_{i,t-1}$	−0.430**	−0.239*			−0.352***	−0.365***	
	(0.215)	(0.146)			(0.113)	(0.130)	
$\Delta m2_{i,t}$			0.554***	0.565***			0.556***
			(0.105)	(0.129)			(0.121)
$\Delta m2_{i,t-1}$			−0.311*	−0.269**			−0.249**
			(0.141)	(0.116)			(0.100)
$\Delta g_{i,t}$	−0.041	−0.123	0.012				
	(0.223)	(0.095)	(0.115)				
$\Delta g_{i,t-1}$	−0.138	0.057	0.063				
	(0.009)	(0.066)	(0.068)				
$\Delta g2_{i,t}$				0.001		−0.029	
				(0.007)		(0.078)	
$\Delta g2_{i,t-1}$				0.083		0.101	
				(0.056)		(0.068)	
$\Delta g3_{i,t}$					0.010		−0.004
					(0.081)		(0.063)
$\Delta g3_{i,t-1}$					0.096		0.086*
					(0.068)		(0.050)
$\Delta yd_{i,t}$	0.114	0.453**	0.309	0.379*	0.166	0.220	0.392**
	(0.265)	(0.210)	(0.211)	(0.202)	(0.255)	(0.270)	(0.193)
$\Delta yd_{i,t-1}$	−0.207	−0.340	−0.403*	−0.344*	−0.191	−0.252	−0.333*
	(0.280)	(0.208)	(0.222)	(0.199)	(0.189)	(0.226)	(0.175)
$\Delta d_{i,t}$		−0.239	−0.179*	−0.243**	−0.165	−0.215*	−0.251**
		(0.156)	(0.124)	(0.121)	(0.119)	(0.128)	(0.121)
$\Delta r_{i,t}$	0.588	0.054	0.374	0.270	0.111	0.199	0.108
	(0.538)	(0.292)	(0.284)	(0.268)	(0.315)	(0.300)	(0.268)
J-test	$\chi^2(9) = 9.7$	$\chi^2(11) = 11.3$	$\chi^2(13) = 9.4$	$\chi^2(11) = 9.2$	$\chi^2(13) = 9.2$	$\chi^2(13) = 9.7$	$\chi^2(13) = 8.4$
	$P = 0.377$	$P = 0.418$	$P = 0.581$	$P = 0.606$	$P = 0.605$	$P = 0.553$	$P = 0.678$
Observations	300	300	300	300	300	300	300

Table 12 reports the results from estimating Equation (7). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 denote two-sided significance levels. Note that although F&K did not report the number of observations they used in their analysis, they should have 300 observations in their estimations if they indeed had a balanced panel dataset.

Table 13: Replication (1970-1996) results of F&K's Table 5, augmented by disposable income

Equation	1	2	3	4	5	6	7
$\Delta c_{i,t-1}$	0.999***	0.908***	0.945***	0.924***	0.964***	0.961***	0.934***
	(0.199)	(0.083)	(0.143)	(0.095)	(0.083)	(0.077)	(0.125)
$\Delta m_{i,t}$	0.425*	0.471***			0.528***	0.477***	
	(0.230)	(0.082)			(0.118)	(0.105)	
$\Delta m_{i,t-1}$	−0.395	−0.416***			−0.498***	−0.450***	
	(0.277)	(0.092)			(0.121)	(0.111)	
$\Delta m2_{i,t}$			0.388***	0.469***			0.451***
			(0.121)	(0.085)			(0.083)
$\Delta m2_{i,t-1}$			−0.350***	−0.418***			−0.415***
			(0.087)	(0.096)			(0.105)
$\Delta g_{i,t}$	0.259	0.082	0.088				
	(0.183)	(0.129)	(0.121)				
$\Delta g_{i,t-1}$	−0.257	−0.090	−0.105				
	(0.178)	(0.130)	(0.136)				
$\Delta g2_{i,t}$				0.033		0.040	
				(0.094)		(0.095)	
$\Delta g2_{i,t-1}$				−0.052		−0.064	
				(0.091)		(0.086)	
$\Delta g3_{i,t}$					0.058		0.088
					(0.073)		(0.085)
$\Delta g3_{i,t-1}$					−0.085		−0.097
					(0.064)		(0.080)
$\Delta yd_{i,t}$	0.281**	0.562***	0.383***	0.625***	0.475***	0.398**	0.497***
	(0.135)	(0.164)	(0.141)	(0.191)	(0.167)	(0.169)	(0.153)
$\Delta yd_{i,t-1}$	−0.011	−0.106	0.008	−0.090	−0.063	−0.019	−0.050
	(0.142)	(0.125)	(0.138)	(0.172)	(0.142)	(0.155)	(0.154)
$\Delta d_{i,t}$		0.425	0.497	0.372	0.710	0.633	0.501
		(0.449)	(0.399)	(0.442)	(0.567)	(0.487)	(0.635)
$\Delta r_{i,t}$	0.010	−0.006	0.001	−0.007	−0.001	−0.002	0.002
	(0.012)	(0.010)	(0.009)	(0.010)	(0.008)	(0.006)	(0.010)
J-test	$\chi^2(9) = 2.25$	$\chi^2(11) = 3.84$	$\chi^2(13) = 2.54$	$\chi^2(11) = 4$	$\chi^2(13) = 3.14$	$\chi^2(13) = 2.27$	$\chi^2(13) = 1.41$
	$P = 0.987$	$P = 0.974$	$P = 0.999$	$P = 0.970$	$P = 0.997$	$P = 1.000$	$P = 1.000$
Observations	225	225	225	225	225	225	225

Table 13 reports the results from estimating Equation (7). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 denote two-sided significance levels.

Table 14: Replication (1996-2015) results of F&K's Table 5, augmented by disposable income

Equation	1	2	3	4	5	6	7
$\Delta c_{i,t-1}$	0.831***	0.743**	0.688***	0.810***	0.738***	0.719***	0.797***
	(0.264)	(0.289)	(0.248)	(0.232)	(0.197)	(0.205)	(0.194)
$\Delta m_{i,t}$	0.327**	0.357**			0.256**	0.373***	
	(0.150)	(0.141)			(0.119)	(0.106)	
$\Delta m_{i,t-1}$	−0.264**	−0.248***			−0.153	−0.255**	
	(0.109)	(0.052)			(0.125)	(0.122)	
$\Delta m2_{i,t}$			0.386***	0.229			0.220*
			(0.143)	(0.143)			(0.127)
$\Delta m2_{i,t-1}$			−0.265***	−0.110			−0.135
			(0.077)	(0.187)			(0.122)
$\Delta g_{i,t}$	0.008	0.024	−0.010				
	(0.124)	(0.143)	(0.158)				
$\Delta g_{i,t-1}$	−0.022	−0.084	−0.005				
	(0.085)	(0.072)	(0.036)				
$\Delta g2_{i,t}$				0.009		0.019	
				(0.171)		(0.150)	
$\Delta g2_{i,t-1}$				−0.176		−0.057	
				(0.125)		(0.087)	
$\Delta g3_{i,t}$					0.011		−0.036
					(0.083)		(0.092)
$\Delta g3_{i,t-1}$					−0.094		−0.106
					(0.080)		(0.070)
$\Delta yd_{i,t}$	0.486***	0.413**	0.389**	0.395**	0.376***	0.398***	0.375**
	(0.155)	(0.207)	(0.154)	(0.183)	(0.138)	(0.130)	(0.148)
$\Delta yd_{i,t-1}$	0.005	−0.022	0.005	−0.026	−0.002	0.008	−0.032
	(0.062)	(0.052)	(0.031)	(0.057)	(0.042)	(0.057)	(0.038)
$\Delta d_{i,t}$		−0.465	−0.422	−0.212	−0.287	−0.270	−0.417
		(0.421)	(0.417)	(0.545)	(0.304)	(0.543)	(0.327)
$\Delta r_{i,t}$	−0.009**	−0.013**	−0.010*	−0.010	−0.006	−0.010*	−0.005
	(0.004)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
J-test	$\chi^2(9) = 1.61$	$\chi^2(11) = 3.17$	$\chi^2(13) = 3.11$	$\chi^2(11) = 0.97$	$\chi^2(13) = 1.52$	$\chi^2(13) = 1.43$	$\chi^2(13) = 1.52$
	$P = 0.996$	$P = 0.988$	$P = 0.997$	$P = 1.000$	$P = 1.000$	$P = 1.000$	$P = 1.000$
Observations	185	185	185	185	185	185	185

Table 14 reports the results from estimating Equation (7). Newey-West standard errors are in parentheses. Apart from working age population share, all variables are logged and first-differenced. ***=0.01, **=0.05. *=0.10 denote two-sided significance levels.