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Does Macroeconomic Policy Affect Private Savings in Europe? Evidence From a Dynamic Panel Data Model *

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Suggested abbreviation of the title: Private savings in Europe

Does Macroeconomic Policy Affect Private Savings in Europe? Evidence From a Dynamic Panel Data Model

Abstract:

Private savings mirror consumption behavior. In Europe, the dynamic of consumption is very low, and at the same time, savings are increasing. Is this a result of macroeconomic policy? A GMM estimator is used to analyze the determinants of private saving in the EU's 15 member states. Our main findings are that savings rates inherit a certain degree of persistence and that income growth causes an increase in saving. While monetary policy is totally insignificant, fiscal policy has a major impact on private savings. The long-run effects of public deficits are greater than the effects of rising income.

Keywords: Dynamic panel data model, private savings, European Union, GMM estimator

JEL-classification: C33, E21

1. Motivation

Saving rates differ widely among the EU's 15 member states: in Ireland the private savings to GDP ratio is above 30 percent, while in Greece it is only about less than 20 percent. Despite these differences in the level of private savings, we see a common trend: after a decline in savings in the 70ies, private savings are now beginning to increase. Private savings mirror consumption behavior. The weak consumption dynamic in several European countries is often blamed for the low economic performance of recent years. Thus identifying the major policy-dependent determinants of private savings has become a key focus for both economists and policy makers.

In this study, we analyze the influence of a variety of different determinants for private savings in EU member countries in order to assess the effects of policy-related and non-policy-related issues. Although these equations are grounded in the theory of private consumption (and saving), we do not impose a narrow structural model but instead employ a reduced-form approach; that is, we allow for a broad range of savings determinants, and, consequently, for a variety of theoretical views about saving. Because of the breadth it offers, this approach has proven useful in tackling our main issue – the identification of the key determinants of private savings. The central hypothesis of our paper is that the determinants of private savings in EU's 15 member states are closely related to fiscal policy, while the impact of monetary policy is negligible.

Although much has been written on the topic of savings, this paper is -- to our knowledge -- the first comprehensive study on private saving in the EU-15. Previous empirical studies have either focused on savings in a broad set of countries, mixing industrialized and emerging economies (Edwards 1995; Loayza/Lopez/Schmidt-

Hebbel/Servén 1998; Bailliu/Reisen 1998; Loayza/Schmidt-Hebbel/Servén 1999 and 2000), or have dealt specifically with the determinants of household savings in one single EU country (Börsch-Supan 2002).

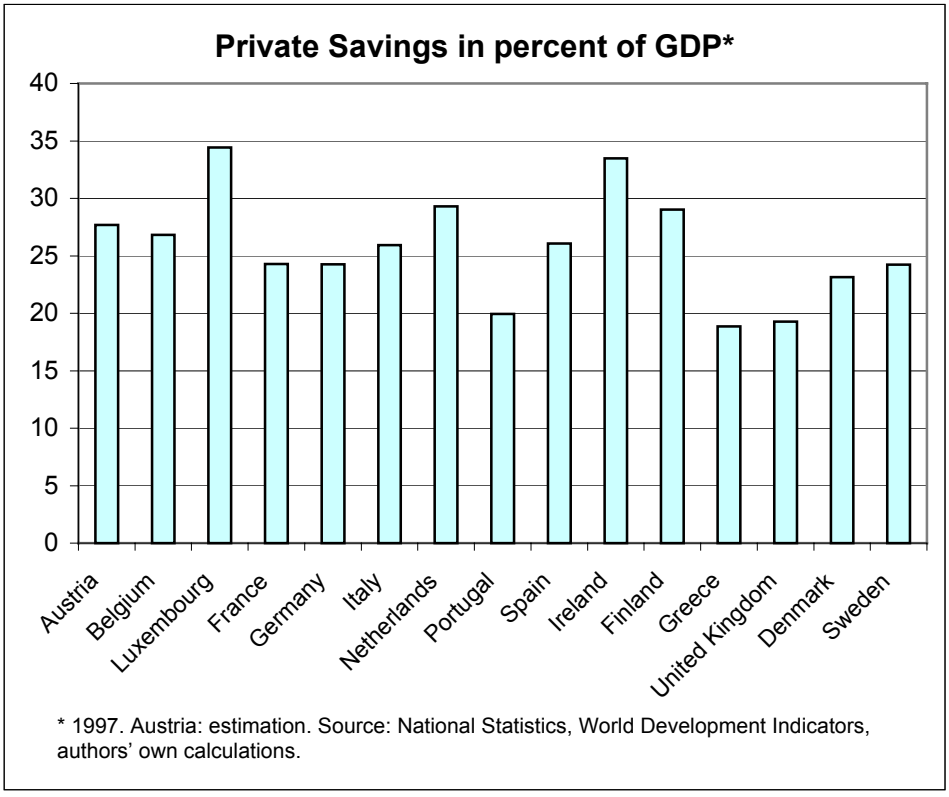
In this paper, we thus seek to fill at least three analytical gaps: First, we investigate the savings determinants for EU-15 countries using a panel data set. Second, we apply an estimation approach which explicitly takes into account two major problems that always arise when savings determinants are empirically investigated: first, since one can expect that savings rates change rather sluggishly due to underlying stable consumption habits, a dynamic specification is required. Second, the majority of explanatory variables might be determined jointly with the savings rate. In this study, we tackle both issues by estimating dynamic panel data models using appropriate Generalized Method of Moments (GMM) estimators. Additionally, the dynamic model specification enables us to find out how the determinants selected here as the most important affect private savings in both the short and long term.

The paper is organized as follows: in Section 2, we sketch out the main characteristics of saving in the EU's 15 member states. In Section 3, we present the data, and in Section 4, we describe the estimation approach and explain how we proceed with the model specification. We present our empirical findings in Section 5, and in Section 6 we summarize our conclusions.

2. Savings in Europe – Stylized Facts and Data

Private saving rates differ remarkably in the EU's 15 member states (Figure 1).[1] While the private sector's propensity to save is high in Luxembourg and Ireland, it is low in Greece, United Kingdom and Portugal. The large variation in savings across European countries raises a host of questions. First and foremost, why do saving rates differ so widely across these industrialized countries? Second, how much do policies contribute to these saving disparities?

Figure 1:



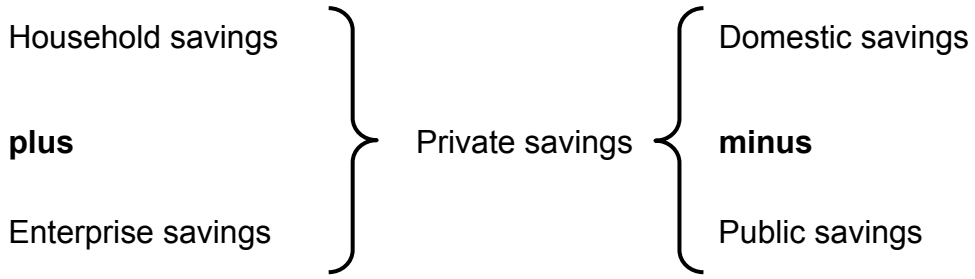
* 1997. Austria: estimation. Source: National Statistics, World Development Indicators, authors' own calculations.

These questions attain even greater importance when considering that private savings mirror private consumption, and that current consumption dynamics are very low in several European countries. For a long time there was a common trend in

private savings despite the huge differences in saving rates in the EU 15: the average saving rate declined over a long period following the oil-price shocks of the 1970s. Nevertheless, in recent times not only the level but also the dynamics of savings have differed widely within the European Union.

Studies that analyze the determinants of private savings empirically always face the same problem: official figures for private savings are nearly impossible to come by. This is true even for the European Union. However, these figures can be calculated using the fact that private savings, by definition, equals the sum of household and enterprise savings as well as the difference between domestic and public savings (Figure 2).

Figure 2: Definition of private savings



Since enterprise savings are unavailable, we have to calculate private savings as the difference between gross domestic savings and public sector savings. For the public sector we used a general concept of government, defined as the consolidated central government plus state, local and regional governments. This offers the advantage of making it possible to compare our findings with previous work on savings in industrialized countries.[2]

Our set of potential key determinants includes the following explanatory variables:

Persistence in savings behavior

– The private savings ratio of the previous period is used to account for persistence in savings patterns due to underlying stable consumption habits.

Income variables

– The annual growth rate of real per capita GDP measured in constant 1995 US dollars is taken as a proxy for growth of per capita income.

Fiscal policy

– The public saving ratio is used to check whether Ricardian effects on private saving can be detected.

Monetary policy

– The real interest rate is calculated as nominal lending rate minus a smoothed inflation rate[3] in order to take expectation-building into account.

Uncertainty

– The unemployment rate is used as a proxy for the individual income uncertainty.

Social Security

– Social security contributions are used as a proxy for social protection.

Financial market performance

– Credit provision to the private sector is calculated as a percentage of GDP to determine access of the private and the enterprise sector to domestic credit.

– M2/nominal GDP is taken as a proxy for financial depth and, thus, for the performance of the domestic financial market.

Demographics

– The dependency ratio, defined as people aged 0-14 and 65 and over to the working-age population, is used to account for unequal income flows over the life-cycle.

International financial integration

– The current account deficit as a percentage of GDP is taken as a proxy for international borrowing and therefore for international financial integration. While commonly used in empirical studies, this variable poses a problem, since it is jointly determined with savings in countries that have access to international financial markets. Otherwise, it is exogenously determined (see Loayza, Schmidt-Hebbel, Servén 1999). We deal with this problem by treating the current account deficit as a strictly endogenous variable in the estimation procedure.

The country set includes the EU's 15 member states: Austria, Belgium, Luxembourg, France, Germany, Italy, Netherlands, Portugal, Spain, Ireland, Finland, United Kingdom, Denmark and Sweden (*N=15*). The regressions are based on annual data taken from the World Bank "World Development Indicators", IMF International Financial Statistics and from national statistics (see Appendix, Table 2 for details). The database covers the period 1971-1999. All data underwent extensive checks to make it comparable and compatible.

3. Econometric Issues

Two significant, general problems arise when saving determinants are investigated empirically. Since it is usually expected that savings rates change only sluggishly due to the underlying stable consumption habits, a dynamic specification is required. Furthermore, it is very likely that the majority of the explanatory variables are determined jointly with the savings rate. Therefore, an estimation procedure has to be chosen which allows and controls for the potential endogeneity of these variables.

In this study, we tackle these issues by estimating dynamic panel data models using the first-differenced GMM estimator (see Arellano/Bond 1991). This estimation procedure relies on a mild assumption concerning the initial conditions process and provides a framework that enables us to deal explicitly with the problem of potential endogeneity of explanatory variables using a set of appropriate instrument variables. Furthermore, the dynamic econometric specification allows us to distinguish between the long-run and short-run effects of the different savings determinants.

Throughout this study, we estimate dynamic fixed-effects panel data models of the form

(1) $$s_{it} = \eta_i + \alpha s_{i,t-1} + \beta' x_{it} + \gamma' x_{i,t-1} + \nu_{it},$$

with $|\alpha| < 1$, s_{it} denoting the savings rate, η_i the time-invariant unobserved country-specific effect, x_{it} the set of potential explanatory variables, ν_{it} a white-noise disturbance term, and i and t denoting country and time period, respectively. This type of model is restrictive in the sense that it allows for heterogeneity across countries only to a limited extent, since only the country-specific effects can differ, whereas the slope coefficients are assumed to be identical across countries. Other recent estimation approaches such as the Pooled Mean Group Estimation

(Pesaran/Shin/Smith 1999) allow for a higher degree of heterogeneity across countries, allowing the short-run coefficients to differ across countries, but constraining the long-run coefficients to be the same. However, since this approach is still difficult to apply technically, it is going to be considered at a future stage of this project. For the time being, we use the first-differenced GMM estimator.

In the following, the methodology for the first-differenced GMM estimator is outlined briefly. Recall the multivariate dynamic fixed-effects panel data model presented in equation (1).

It is assumed that the standard assumption concerning the initial conditions s_{i1} holds, such that

(2) $$E(s_{i1}\nu_{it}) = 0 \quad for \quad i = 1,...,N \;\; and \;\; t = 2,...,T \,,$$

stating that the initial conditions are uncorrelated with subsequent disturbances (see Blundell 2002). Furthermore, the x_{it} process is correlated with the country-specific fixed effects η_i.

Since the choice of appropriate instruments for the explanatory variables depends on the correlation structure between the x_{it} process and the disturbance term ν_{it}, we have to distinguish carefully between the following correlation structures:

1. If the x_{it} process is *strictly exogenous*, there is no correlation between the x_{it} process and the disturbance term v_{it} at all leads or lags.

2. If the x_{it} process is *weakly exogenous* or *predetermined*, it is correlated with past realizations of the disturbance term, but uncorrelated with contemporaneous or future realizations of the disturbance term.

3. If the x_{it} process is *endogenously* determined, it is correlated with past and contemporaneous realizations of the disturbance term, but uncorrelated with future realizations of the disturbance term.

The moment conditions for the first-differenced GMM estimator are

(3) $$E\left(s_{i,t-s}\Delta v_{it}\right)=0 \quad for \quad t=3,...,T \quad and \quad 2\le s\le t-1$$ and

(4.1) $$E\left(x_{ij}\Delta v_{it}\right)=0 \quad for \quad t=3,...,T \quad and \quad 1\le j\le T$$

when the x_{it} process is strictly exogenously determined; or

(4.2) $$E\left(x_{i,t-r}\Delta v_{it}\right)=0 \quad for \quad t=3,...,T \quad and \quad 1\le r\le t-1$$

when the x_{it} process is predetermined; or

(4.3) $$E\left(x_{i,t-l}\Delta v_{it}\right)=0 \quad for \quad t=3,...,T \quad and \quad 2\le l\le t-1$$

when the x_{it} process is endogenously determined.

In this study, we proceed on the assumption that only demographic variables are strictly exogenous. All other explanatory variables are treated as endogenous for the time being. The validity of this assumption is checked in the course of model specification using appropriate test statistics.

Concerning the model specification and evaluation, we proceed as follows: A dynamic specification is required to assure that the parameters of interest can be identified and precisely estimated (see Bond 2002). Concerning the choice of variables, we started “from general to specific”; insignificant variables are excluded from the initial model step by step.

The models are estimated applying the one-step first-differenced GMM estimator, which is based on a restricted instrument set in this study in order to avoid the

problem of overfitting biases (Bond 2002). For each model, the validity of the instrument variables is checked using the Sargan test of over-identifying restrictions (see e.g. Arellano/Bond 1991). The model specification is confirmed if the null hypothesis, stating that the instruments are valid, cannot be rejected. Furthermore, since the consistency of the GMM estimator depends upon the assumption that the disturbance terms are not serially correlated, we always check for this, exploiting the fact that if the disturbance terms are serially correlated, we will detect second-order serial correlation in the first-differenced residuals. The lack of second-order serial correlation in the differenced residuals therefore indicates that the disturbance terms are serially uncorrelated.

Our estimation results are presented in Table 1; the final model specification is marked by a shaded column. The country-specific effects are significant and not reported in the table. All estimations are performed using PcGive version 10.

4. Empirical Results

Our central finding is that macroeconomic policy strongly affects private savings in EU member countries. We show that while fiscal policy does have a strong impact on savings, monetary policy does not. In the following we examine the results in detail.

Savings rates of the previous period have a positive and highly significant effect on today's savings rates. The coefficient is about 0.55 (Table 1) – indicating that savings rates inherit a certain degree of persistence. The persistence of private savings rates is usually explained by the relative stability of consumption habits. This finding is fully in line with the results reported by Loayza/Schmidt-Hebbel/Servén (1999), who analyzed the determinants of private savings for a set of 150 industrialised and emerging economies. Loayza et al. (1999) report a coefficient of the lagged private savings rate of about 0.67 for OECD countries. Since one of the estimation approaches they applied was the first-differenced GMM estimator and a similar set of explanatory variables, we can compare their results to ours.

According to our results, per capita income growth is positively related to private savings. Again comparable findings are reported in a variety of empirical studies (Masson/Bayoumi/Samiei 1995; Loayza/Schmidt-Hebbel/Servén 1999). We found that long-run effects of income growth are higher than the short-run effects (0.93 and 0.33, respectively). This underpins the hypothesis that the private saving behavior is rather persistent.

The government affects private savings not only through certain policies that enhance growth, but also directly, through its own saving behavior. We show that an increase in the savings rate of the public sector leads to a significant decline in private savings; hence providing evidence that public savings crowd out private

savings. We found that this effect is important not only in the short run, but in the long run as well.[4] A 1% increase in the public savings ratio will lead to a 0.84% decrease in private savings. In other words, if the budget deficit is increasing, people tend to save more; at the same time, consumption dynamics are repressed. This finding in very important in the context of the recent debate within the EU on fiscal policy.

Our findings show that in contrast to fiscal policy, monetary policy has an only negligible effect on private savings. Again this is in line with many other empirical studies, most of which have been unable to show that interest rates have any impact on the level of savings in industrialized countries. While interest rates do not determine how much people save, they do seem to be more important in determining portfolio allocation.

We found a relationship between private savings and financial sector performance. Since the financial system in the EU countries is mainly bank-based, higher savings are closely connected to an increase in financial depth, which is an increase in the M2/GDP ratio. In model 1 we also include the share of private credit to GDP, which was insignificant and therefore excluded from the model. It is remarkable that we could not detect any direct influence of the share of private credit to GDP on private savings in EU countries. Nevertheless, comparable findings are reported in many studies on savings (Loayza/Lopez/Schmidt-Hebbel/Servén 1998; Bailliu/Reisen 1998; Loayza/Schmidt-Hebbel/Servén 1999; Loayza/Schmidt-Hebbel/Servén 2000).

In our study, the unemployment rate is used to account for individual income uncertainty. Although one would expect that not the level but the volatility of the unemployment rate could have an influence on private saving behavior, this variable was tested in our study in order to ensure the comparability with previous studies. In

none of the models we could detect a significant influence of the unemployment rate on private saving.

The current account deficit was used as a proxy for international integration, since it implies that a country receives credit from other countries. Assuming that domestic savings and foreign capital might be substitutes, it is expected that a higher current account deficit is linked to reductions in domestic savings. These expectations are supported by the estimation results. Since the time series for the current account deficit includes negative values and since the estimated coefficient is positive, an increase in the current account deficit (e.g. larger negative values) decreases private savings in the home country. This finding supports the idea that the EU-countries have a good access to the international financial market and that domestic savings and foreign capital operate at least partly as substitutes.

According to the life-cycle hypothesis, individuals save the most when they earn the most, i.e. during their working life. Correspondingly, it is assumed that individuals have negative saving rates both when they are young and also during retirement, when their income is generally low. In other words, this means that on an aggregate level, a higher proportion of people outside the work force and therefore having little or no income reduces private savings. Nevertheless, for EU countries the dependency ratio was totally insignificant. Our finding might be due to the existing public pension systems in Western Europe, which ensure a fairly high personal income level during retirement.

We could not detect any statistically significant effects of the social security system on private savings. However, the long-run coefficient is positive what at first glance seems to be confusing but is in line with the findings in the existing literature (Meinhard).

Table 1: Private savings rate: Alternative specifications

	Results for the one-step first-differenced GMM estimator (with heteroscedasticity-consistent standard errors and test statistics)						
	EU countries						
Sample:	1973-1999						
Model:	1	2	3	4	5	6	7
Lagged private saving rate	0.61 (15.7)	0.62 (11.8)	0.62 (10.7)	0.62 (11.5)	0.57 (8.77)	0.57 (8.73)	0.55 (8.74)
Public saving rate	-0.88 (-28.5)	-0.87 (-18.8)	-0.88 (-20.1)	-0.88 (-19.8)	-0.90 (-18.3)	-0.91 (-17.5)	-0.90 (-26.7)
Lagged public saving rate	0.53 (10.1)	0.54 (7.05)	0.54 (6.99)	0.54 (7.66)	0.51 (6.44)	0.51 (6.66)	0.52 (7.34)
Dependency ratio	-0.02 (-0.47)	0.00 (0.13)					
Current account deficit	0.28 (5.04)	0.26 (4.64)	0.25 (4.39)	0.27 (5.11)	0.28 (5.52)	0.29 (6.13)	0.26 (5.17)
Lagged current account deficit	-0.18 (-3.62)	-0.22 (-4.25)	-0.22 (-4.16)	-0.21 (-4.14)	-0.21 (-5.00)	-0.20 (-4.92)	-0.17 (-3.55)
Growth rate of real per-capita GDP	0.35 (7.22)	0.38 (6.78)	0.38 (6.84)	0.38 (6.75)	0.39 (6.04)	0.37 (8.06)	0.33 (9.01)
Lagged growth rate of real per-capita GDP	0.12 (3.39)	0.11 (3.77)	0.12 (4.03)	0.10 (3.24)	0.13 (3.94)	0.11 (5.08)	0.09 (3.51)
M2/GDP	-0.00 (-0.06)	0.02 (1.29)	0.01 (0.74)	0.00 (0.29)	0.01 (1.48)	0.01 (1.49)	0.02 (2.15)
Lagged M2/GDP	0.02 (1.07)	0.00 (0.04)					
Real interest rate	0.07 (1.20)	0.09 (1.50)	0.08 (1.22)	-0.01 (-0.27)			
Lagged real interest rate	-0.10 (-1.03)	-0.11 (-1.09)	-0.10 (-1.10)				

Table 1: Private savings rate: Alternative specifications (continued)

	Results for the one-step first-differenced GMM estimator (with heteroscedasticity-consistent standard errors and test statistics)						
	EU countries						
Sample:	1973-1999						
Model:	1	2	3	4	5	6	7
Credit to private sector	0.02 (1.62)						
Lagged credit to private sector	-0.00 (-0.27)						
Unemployment	0.07 (0.88)	0.10 (1.21)	0.11 (1.45)	0.08 (0.88)	0.07 (0.78)		
Lagged unemployment	-0.06 (-1.18)	-0.09 (-1.49)	-0.11 (-1.69)	-0.11 (-1.35)	-0.11 (-1.32)	-0.05 (-1.54)	
Social security	0.05 (1.80)	0.06 (1.61)	0.06 (1.73)	0.07 (1.89)	0.07 (1.69)	0.05 (1.44)	
Lagged social security	-0.02 (-0.68)	-0.03 (-1.00)	-0.04 (-1.18)	-0.04 (-1.12)	-0.03 (-0.83)		
Obs	271	271	276	278	282	282	282
Sargan Test	264.7 [0.29]	242.9 [0.24]	250.1 [0.16]	246.8 [0.21]	230.0 [0.10]	238.1 [0. 06]	308.7 [0.19]
AR (1) Test	-3.02** [0.003]	-3.06** [0.002]	-3.03** [0.002]	-2.93** [0.003]	-2.78** [0.005]	-2.76** [0.006]	-2.75** [0.006]
AR (2) Test	-0.93 [0.35]	-1.05 [0.30]	-1.08 [0.28]	-1.37 [0.17]	-1.09 [0.28]	-1.16 [0.25]	-1.28 [0.20]
Model settings							
Transformation used	first differences						
Transformed instruments	DepRatio						
Level instruments	Dummies, Gmm(PRIVSAV,2,3), Gmm(PUBSAV,2,2), Gmm(Caccount,2,2), Gmm(prcredit, 2,2), Gmm(M2/GDP,2,2), Gmm(inc_growth,2,2), Gmm(lendr,2,2), Gmm(unemploy,2,2), Gmm(socsec,2,2)	Dummies, Gmm(PRIVSAV,2,3), Gmm(PUBSAV,2,2), Gmm(Caccount,2,2), Gmm(M2/GDP,2,2), Gmm(inc_growth,2,2), Gmm(lendr,2,2), Gmm(unemploy,2,2), Gmm(socsec,2,2)			Dummies, Gmm(PRIVSAV,2,3), Gmm(PUBSAV,2,2), Gmm(Caccount,2,2), Gmm(M2/GDP,2,2), Gmm(inc_growth,2,2), Gmm(unemploy,2,2), Gmm(socsec,2,2))	Dummies, Gmm(PRIVSAV,2,3), Gmm(PUBSAV,2,2), Gmm(Caccount,2,2), Gmm(M2/GDP,2,2), Gmm(inc_growth,2,2), Gmm(unemploy,2,2), Gmm(socsec,2,2))	Dummies, Gmm(PRIVSAV,2,4), Gmm(PUBSAV,2,3), Gmm(Caccount,2,3), Gmm(inc_growth,2,3), Gmm(M2_GDP,2,3)

t-values in brackets

*, ** and ***: significant at the 10%, 5% and 1% level

5. Conclusions

In the European Union, both economic growth and private saving differ widely among member states. Private savings mirror consumption behavior. Since the low consumption dynamics in several EU countries often is made responsible for their low economic performance, it is crucial to understand the relevant factors determining savings. This question is not only important for economists but also for policy makers.

The major empirical findings presented in our study are:

- Private savings in the EU maintain a certain degree of persistence.
- Increases in per capita income growth have a positive impact on private savings.
- Fiscal policy influences private savings. Any increase in public dis-saving leads to a positive reaction of private saving. In other words we found some empirical evidence for Ricardian equivalence in Europe.
- In contrast to fiscal policy, monetary policy does not have any impact on the level of savings.
- Since the European financial system is a bank-based one, an increase in saving is linked to an increase in “financial depth”, which is measured by the M2/GDP ratio.

We found that private savings and therefore consumption patterns can be influenced by *fiscal policy*. In contrast to frequent assertions of other studies, we found that higher budget deficits crowd out the behavior of the private sector.

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Table 2: List of data sources

Data	***Source***
Private savings rates (see chapter 2)	World Bank, World saving database, IMF
Demographic Structure	
Dependency ratios	World Bank, World Development Indicators
Economic Development	
GDP per capita	World Bank, World Development Indicators, own calculations
GDP growth	World Bank, World Development Indicators, National Statistics
Domestic saving	World Bank, World Development Indicators
Unemployment	National Statistics
Current account balance	World Bank, World Development Indicators, International Monetary Fund, International Financial Statistics
Monetary and Financial Market Indicators	
CPI	National Statistics
Private or domestic credit	International Monetary Fund, International Financial Statistics
Interest rates	International Monetary Fund, International Financial Statistics
Real interest rate	Own calculations
M2/GDP	International Monetary Fund, International Financial Statistics, own calculations
Fiscal Policy	
Overall budget balance	World Bank, World Development Indicators

[1] In Figure 1 the private savings ratios of the EU member countries in 1997 are displayed. Our aim was to take a year prior to the monetary union. For the year 1998 public saving is still unavailable for many EU countries. Consequently, the private savings rate is still lacking for these countries in 1998.

[2] There is an important question, how the method of calculating private savings influence the estimation results. In another paper (Schrooten/Stephan 2003) we compared two different time series for the private savings rates in the EU member countries. One is calculated as described above. The other is provided by the World Bank in the 'World saving database': again, private savings are calculated as the difference between gross domestic savings and public sector savings, but public sector savings are adjusted for net capital transfers. The private savings rate is the ratio of private savings to gross national disposable income. A comparison of the estimated models for these alternative versions of the private savings rate show that the way of calculating the private savings rate hardly effects the estimation results. Against this background, we concluded that the simple approach for the calculation of the private savings rate has any negative effects on the reliability of the estimation results. We decided to not to use the World Bank figures since they only cover the period 1973-1994.

[3] $r_t = \ln(1+i_t) - \ln\left(1 + \frac{\pi_{t-1} + \pi_t + \pi_{t+1}}{3}\right)$

[4] The long-run effect of public savings in model 7 is calculated as follows: (-0.90+0.52)/(1-0.55) = -0.84, where the nominator is the sum of the coefficients of the public saving rate in *t* and *t-1* and the denominator is 1 minus the coefficient of the lagged private savings rate.