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**Małgorzata Jakubiak, Paweł Kaczorowski,  
Joanna Siwińska, Tomasz Tokarski**

**Private, Public and Foreign Savings**

*W a r s a w , 1 9 9 9*

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## **Abstracts**

### **Saving, Investment, Financial Integration and FDI in Central Europe** **Małgorzata Jakubiak**

Evidence on domestic savings and investments in industrialised countries indicates that capital markets are not perfectly integrated. On the contrary, various measures of financial integration prove that capital has become highly mobile. This paper presents theoretical explanations for this fact, data on the European Union "Northern" and "Southern" states and estimations of the saving-investment relation for some emerging Central and Eastern European countries (CEECs).

It was found that domestic investments in Poland, Hungary, Estonia, and the Czech Republic have been partly financed by FDI inflows in recent years. A similar situation was taking place in the so-called "Southern" Europe in the 1980s. There has been a geographical shift in FDI inflows from Southern EU countries to more developed CEECs in the mid-1990s. It seems possible that fast growing FDI inflows in Poland and in Estonia could hamper the future growth of saving rate.

### **The Interactions between Private Savings and Governments Budget Deficits** **Joanna Siwińska**

This paper attempts to assess the influence of government budget deficit on private saving rate, with special emphasis on Poland and other transition economies. The theoretical predictions concerning the direct impact of budget actions on private savings are given by the Ricardian-Barro Equivalence Theorem and the Neo-classical view. Existing empirical research on the correctness of the Ricardian versus the Classical view is largely inconclusive.

A simple empirical analysis for Poland indicates, that in years 1991–1997 there was no strong Ricardian-type relationship between the government net lending and private savings. There is however a possibility of the existence of a weak form of Ricardian Equivalence in Poland, when one assumes, that the social security is treated differently than the rest of government net lending, and therefore social security balance is excluded from government budget balance. However, much longer time series is needed to draw any strong conclusions.

## **Influence of Interest Rates on Credits and Deposits of Non-financial Sector in Poland**

**Paweł Kaczorowski, Tomasz Tokarski**

The main purpose of this paper is to analyse factors that influence the magnitude of credits and deposits held by households and enterprises. The analysis is performed for the period 1994–1998 using quarterly time-series data. The magnitude of credits and deposits was initially supposed to depend on GDP, real interest rate, real exchange rate, and  $M_2/H$  ratio (explaining the development of banking sector in Poland). Authors conclude that the growth rate of zloty denominated deposits held both by households and by enterprises is positively correlated with real interest rate, and that this relation is stronger in the case of households. It can be said that the development of banking sector in Poland influences the growth of credits and deposits held by households, but it does not affect the behaviour of firms. It seems that GDP influences the growth rate of deposits, while it has no effect on the demand for credits in Poland. A change in the real interest rate matters only for corporate actions.

# **Part I. Saving, Investment, Financial Integration and FDI in Central Europe**

## **Małgorzata Jakubiak**

### **1.1. Introduction**

Evidence on domestic savings and investments in industrialised countries indicates that capital markets are not perfectly integrated. On the contrary, various measures of financial integration prove that capital has become highly mobile. This paper presents theoretical explanations for this fact, empirics on the European Union "North" and "South" states and estimations of the saving-investment relation for some emerging East and Central European countries. Poland stays in the centre of interest.

It was observed, that part of the investments done in the so called "Southern" EU countries was financed by the capital from abroad, from which foreign direct investment played an important role. More advanced Central and East European countries have been characterised by growing flows of FDI in the 1990s, therefore the magnitude and dynamics of FDI in the region are also analysed with their possible impact on domestic investment.

The paper is organised as follows. First part looks at the Feldstein-Horioka paradox of saving and investment correlation in a world of (perceived) high capital mobility, its critique and proposed explanations of the phenomenon. Section two examines evidence on the saving and investment rates of the EU countries. Section three takes a closer look at Central European saving, investment, and FDI trends and formulates predictions.

### **1.2. National Saving, International Investment and Capital Flows**

#### **1.2.1. National Saving and International Investment**

The evidence on saving-investment correlation indicates that markets are not perfectly integrated, while it seems that 1990s brought almost perfect capital mobility in Europe. Original finding of high S-I correlation – the Feldstein-Horioka paradox – seemed to contradict the belief that nowadays capital is highly mobile. This part of the paper reviews the literature on saving-investment correlation, the evidence on financial markets integration, and presents possible explanations of the phenomenon.

### **Feldstein-Horioka paradox**

In a closed economy saving equals investment by an identity. In an open economy case the difference between these two aggregates is reflected in the current account. Feldstein and Horioka (1980) postulate that when capital is perfectly mobile between countries so that it can flow freely to equalise the yield of investors, there should be no correlation between a nation's saving and investment rates. If domestic saving were added to a world saving pool and domestic investment competed for funds in that same world saving pool, the saving that originate in a country did not have to remain there. On the contrary, if there are numerous restrictions on capital flows, domestic saving and investment should be highly correlated. It is obvious that these two cases have different implications for domestic policies.

To assess the evidence between saving rates and investment rates Feldstein and Horioka (1980) estimated cross-sectional regression of the form:

$$(I/Y)_i = \alpha + \beta(S/Y)_i \quad (1)$$

where  $(I/Y)_i$  represented the ratio of gross domestic investment to gross domestic product and  $(S/Y)_i$  was the corresponding ratio of gross domestic saving to gross domestic product. The analysis was conducted for 21 OECD countries and the average 15-years ratios (1960–1974) were used. The estimate of  $\beta$  for the entire period was 0.89 with the standard error equal to 0.07 and was not significantly different from one.

From the above regression Feldstein and Horioka (1980) drew the conclusion that the evidence strongly contradicts the hypothesis of perfect world capital mobility and indicates that in the long run most of any incremental saving tends to remain in the country in which the saving is done.

Moreover, they found that while the link between saving and investment may vary among countries, there was no evidence that it varied in relation to either the size of the economy or the importance of international trade. The authors also reestimated the equation taking into account the potential endogeneity of the saving ratio. They constructed the simultaneous equations model which consisted of some structural features. These variables were supposed to be responsible for inter-country differences in saving rates according to the traditional life-cycle model. The growth rate of income and the ratio of retirees to the working age population were among these structural variables. The evidence did not alter their earlier results of imperfect capital mobility.

Feldstein and Bacchetta (1991) re-examined the data through the period 1980–1986 and concluded that there has been a substantial decline in the correlation between the rates of gross domestic saving and gross domestic investment for 23 OECD countries.

However, an increase in domestic saving still had a strong effect on the level of domestic investment, although this effect was smaller than in the 1960s and in the 1970s. Even in the 1980s, the saving retention coefficient ( $\beta$  from eq. 1) was above 0.80 for all 23 OECD countries.

### **Saving and investment disaggregated**

Feldstein and Horioka (1980) examined whether investment was equally responsive to different forms of savings. They disaggregated total savings into three components: government saving ( $SG$ ), household saving ( $SH$ ), and corporate saving ( $SC$ ), and estimated the following regression for nine OECD countries during the period 1961–1974:

$$(I/Y)_i = \alpha + \beta_H(SH/Y)_i + \beta_C(SC/Y)_i + \beta_G(SG/Y)_i \quad (2)$$

The coefficients on different types of saving were very close reflecting the similar contribution of the three types of saving to total investment. However, at a more disaggregated level of corporate investment, corporate saving was found to be more responsive than other sources of funds.

Feldstein and Bacchetta (1991) estimated the similar regression which divided domestic saving into two components: government saving and private saving for 1970–1985 (13 countries) and 1965–1984 (9 countries) periods. Their results implied that either the source of the variation in national saving had the same effect on domestic investment.

### **Understanding reasons for high saving-investment correlation [Dornbusch, 1991]**

Dornbusch (1991) commented the 1991 Feldstein and Bacchetta study writing that "unusually high savings retention is now well established as a fact" [Dornbusch, 1991: 226]. However, he pointed out that there may have existed different channels through which the high correlation between saving and investment in open economies occurs. The reasons for such a strong link according to Dornbusch can be the following:

- constraints on external balances that can limit the extent to which investment can get out of line with saving;
- capital mobility may depend on the actual size of a firm within an economy, so that only large corporations and public sector may have access to world markets;
- regulatory treatments of financial institutions may enhance investors' risk aversion thus causing imperfect capital mobility;
- savings-investment correlation may reflect an economic structure that induces simultaneously both high saving and high investment.

Dornbusch treats the Feldstein-Horioka thesis of imperfect world capital mobility with caution saying that unless we understand the reasons underlying the strong correlation, we should not make strong inferences about the investment response to saving policies.

### **US breaks F-H paradox in the 1980s [Dornbusch, 1991; Frankel, 1991]**

The observed saving-investment correlation for the aggregated sample of the OECD countries does not seem to occur for every individual country. As Dornbusch (1991) and Frankel (1991) noted, there is a striking discrepancy between the 1980s and the earlier period in the US data. The general saving-investment positive correlation broke down in the 1980s reflecting large current account deficits when declines in US saving rates were not matched by corresponding declines in investment rates. Till now, it is difficult to assess whether this phenomenon reflects a world wide trend or whether it is peculiar to the US [Dornbusch, 1991] as a consequence of financial liberalisation in Japan, the UK, and the developments of Euromarkets [Frankel, 1991].

### **Saving-investment correlation cannot serve as test of international capital mobility [Jansen, 1996]**

Jansen (1996) postulates that the high saving-investment correlation found in cross-sectional studies reflects the cointegration of each country's saving and investment rate over time. This means that there is a long run equilibrium relationship between saving and investment, although both series may have trends or cyclical variations. Jansen stresses that the feature which stands behind this long run relationship is precisely the intertemporal budget constraint. He argues that in the short run different disturbances may push the system out of equilibrium, but the disequilibrium error, i. e. the current account tend to fluctuate around its mean value.

Jansen applied the ECM to 23 OECD countries (1952–1991 period) and found that countries exhibited considerable differences in the short run saving-investment correlations: some of them were characterised by the high contemporaneous correlations and for some others there was no relation between changes in saving and changes in investment through the 1952–1991 period. He also performed the Monte Carlo simulations that resulted in the original Feldstein-Horioka regression equation yielding estimates of the "retention coefficient" which strongly tended towards one because of intertemporal budget constraint and possibly because of limited capital mobility. Since it is not possible to identify the individual contributions of the two, Jansen concluded that cross-sectional regressions in levels were therefore inappropriate for both measuring the degree of capital mobility and testing for its presence.

Jansen proposed another way of testing international capital mobility. He run cross-sectional regressions for every year relating changes in investment rates to changes in the rates of saving. Estimates of annual changes in saving and investment were not affected by the intertemporal budget constraint, while restrictions on capital flows might still be able to give rise to a positive saving-investment correlations. Jansen expected to obtain a downward trend over time in the value of the correlation since it is believed that capital mobility has substantially increased from the 1950s. However, the estimates of the correlation effect turned out to be highly volatile from year to year, so that they would rather represented distorting role of country-specific business cycle effects. Jansen thus concluded that the short run correlation reflected mainly adjustments to supply and demand shocks which differ across countries and therefore the short run saving-investment correlation has no economic meaning.

Jansen (1996) concludes that it is impossible to construct a reliable test of Feldstein and Horioka basic idea that the correlation of saving and investment in a cross-section of data provides information on the degree of global capital mobility. Instead, he proposes to consider short and long run analyses on the level of individual country, which can yield interesting country specific tests.

### **International capital flows reconsidered [Feldstein, 1994]**

Feldstein (1994) investigated the nature of global capital flows and its implications for tax policy. He claimed that although capital is generally free to move across national borders there is strong evidence on capital market segmentation that make it relatively immobile. Therefore, as Feldstein argues, the original Feldstein-Horioka regressions reflected the relationship between savings and capital flows that were actually taking place.

Feldstein presents evidence that capital can and does move across borders, with the most direct proof being the equality of interest rates on identical securities in different markets. On the other hand, there is strong evidence that capital does not move across national borders in the same way that it does within countries. The most powerful confirmation of this proposition comes from the original investment-saving equations. There is also some evidence supporting the segmentation of global capital market, like a "home country bias" in investment portfolios, the fact that uncovered interest parity and real interest parity do not hold for major currencies, and the observed evolution of the capital stock to GDP ratio for some OECD countries. Feldstein summarised this evidence by concluding that capital is internationally mobile while its owners prefer to keep it at home. He pointed that "evidence that capital can move and that some capital moves is not the same as evidence that capital is allocated globally without regard to national boundaries".

The explanations of Feldstein thesis are similar to those of Dornbusch (1991) with the emphasis put on currency hedging. He states that while some capital may be truly global and moving in the direction of the highest expected rate of return available, this may not be true for all investors. Risk aversion can also play an important role in discounting the gains from actual capital flows, with the currency risk being of particular significance. The presence of this risk causes many portfolio managers to hedge substantial amounts of their foreign portfolio investments, so that investors can take positions in foreign securities without a net transfer of capital across borders. Therefore, as Feldstein argues, it may be misleading to look at the amounts of foreign portfolio investment or foreign borrowing and draw inferences about the corresponding amount of true international capital movements.

Feldstein also observed that outbound foreign direct investment reduced domestic investment by an approximately equal amount while it had not any effect on domestic saving.

The analyses that have already been described, gave a clear picture of S-I correlation well established as a fact. At this point, it is worth to refer to evidence on capital flows that are really taking place. Studies mentioned below, assess the extent of capital mobility in the EU and in Eastern Europe.

## **1.2.2. Evidence on Financial Markets Integration**

### **Quantifying capital mobility**

Frankel (1991) presents four alternative definitions of international capital mobility and applies them to test a sample of 25 countries. Among those definitions is the Feldstein-Horioka definition, real interest parity, uncovered interest parity, and covered interest parity. Frankel presents them according to their specificity, and indicates that uncovered interest parity requires closed interest rate parity – the claim that capital flows equalise interest rates across countries when contracted in single currency – plus an assumption that the exchange rate risk premium is zero. Real interest parity, in turn, requires uncovered interest parity plus the condition that expected exchange rate depreciation is zero. Then the Feldstein-Horioka test requires not only real interest parity – that international capital flows equalise interest rates across countries – but also an assumption about the determinants of investments.

Frankel (1991) concludes that by 1988, the integration of the financial markets in the 1980s, and what follows, international capital flows, eliminated short-term interest differentials for major industrial countries. The research results suggest that capital has

been world-wide mobile when measured by covered interest rate parity. In other words, from the measures described above, only the real interest rate differentials adjusted for expected real currency depreciation remained small.

Some of the European countries were included in the sample data. Covered interest differentials, during the years 1982–1988, recorded relatively small magnitudes for countries known to be free of capital controls like Germany, Switzerland, and the Netherlands. The differentials were also small for another group of European countries that begun removing their capital controls in the 1970s or in the 1980s, that is for the United Kingdom, Austria, Belgium, Ireland, Italy and Sweden. The covered interest differentials remained significantly negative for France and large and negative for Spain, Denmark, Portugal, and Greece, implying controls on capital outflow.

### **Capital controls in industrial and transition countries**

Tamirisa (1998) examines effects of exchange and capital controls on trade for 1996. She constructs an index of capital controls, which captures information on around 50 individual types of control from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. The index encompasses controls on capital and money market securities, derivatives, credit operations, FDI, real estate transactions, provisions specific to commercial banks, other credit institutions and institutional investors, surrender and repatriation requirements. Tamirisa presents indices for aggregated group of countries, where industrial countries are compared with a group consisting of both developing and transitional countries. The natural conclusion appears that developing and transitional economies have more extensive capital controls.

### **Liberalisation of capital controls and emerging markets' financial integration**

The 1990s have witnessed a movement of capital into emerging markets on a scale not seen since the gold standard era of the late 1800s and early 1900s [IMF International Capital Markets, 1997]. IMF International Capital Markets presents the scale of these capital flows and puts the recent flow into emerging markets in historical perspective.

The capital control index, constructed for 163 emerging countries – including Asian, South American, and East European economies – shows the loosening of capital controls there since the mid-1980s. The measure accounts for restrictions on capital account transactions, multiple exchange rate practices, and surrender requirements for export proceeds. This index has been falling rapidly since 1990, which has been matched by the recent boom in capital flows into emerging markets – as measured by the ratio of capital flows to GDP.

An index of integration developed by the World Bank combines a measure of a country's ability to attract different forms of private flows – that is portfolio capital flows,

commercial bank flows, and FDI – and a measure of a diversification of a country's source of finance. The measure is based on ratings by Institutional Investor magazine. It shows that there occurs the process of further financial integration of emerging markets.

### **Financial integration indicators**

When investment portfolios have become increasingly global, the differences in "attractiveness" of particular countries have become more and more important. The relative magnitudes of capital flows, and associated with location of capital in any given market can then be used as an approximation of risk perceived by investors. Therefore, countries in which capital controls are substantial, as evaluated by a country risk or creditworthiness, should not experience large capital flows.

Table I presents financial integration indicators, published by the World Bank [World Development Indicators, 1997]. Institutional Investor credit ratings, that allow to rank countries according to portfolio investment opportunities, are based on information provided by leading international banks. The indicator ranges from 0 to 100. Gross capital flow ratios approximate the depth of financial integration. They are better indicators than the net flows, because they measure total value of financial transactions during a given period. Gross private capital flows are the sum of the absolute values of direct, portfolio, and other investment inflows and outflows recorded in the balance of payments financial account, excluding assets and liabilities of monetary authorities and general government. Gross foreign direct investment is calculated as the sum of the absolute values of inflows and outflows of FDI recorded in the balance of payments financial account. Both indicators are calculated as ratios to GDP converted to dollars using PPP.

After the closer examination of table I, the following pattern reveals. The institutional investors credit ratings for Poland (50.2) and Hungary (49.7) are not very far from the indicator for Greece, that is 53.0. Portugal, Italy and Spain recorded the next closest – although quite distinct – values of, respectively 71.2, 75.4, and 75.5. United Kingdom, France, and Netherlands obtained the "least risky" grades of around 90.

Gross private capital flows as a percentage of GDP for Poland (9.3) are again not very far from those of Greece (10.9) and Spain (10.3). Hungary then recorded in 1996 a value of 14.0, which brings the country closer to Portugal, with gross private capital flows to GDP ratio of 19.0, and Italy (19.1). The evidence on gross FDI is more mixed. Polish and Hungarian FDI flow shares – that presumably reflect inward investment flows – are again similar to the values for Greece, Portugal, Spain, and Italy.

The gross indicators probably reflect different features of these capital flows, that is an inward investment in Eastern Europe, and more balanced flows in the EU. But still, they provide a reliable information on the relative amounts of these flows in 1996.

Table 1. Capital flows and financial integration indicators, 1996

	<b>Institutional Investors credit rating</b>	<b>gross private capital flows (% of GDP)</b>	<b>gross FDI (% of GDP)</b>
AUSTRIA	86.5	22.0	2.9
BELGIUM	81.3		
DENMARK	82.6	27.8	2.7
FINLAND	76.6	29.7	5.6
FRANCE	88.4	17.2	3.7
GREECE	53.0	10.9	0.8
IRELAND	76.7	66.5	4.7
ITALY	75.4	19.1	0.8
NETHERLANDS	90.6	35.5	9.0
PORTUGAL	71.2	19.0	1.0
SPAIN	75.5	10.3	1.9
SWEDEN	76.2	92.6	6.1
UNITED KINGDOM	88.4	59.9	6.6
POLAND	50.2	9.3	2.0
HUNGARY	49.7	14.0	2.8
BELARUS	14.2		
BULGARIA	22.2	6.4	0.4
CROATIA	33.6	12.3	1.7
CZECH REPUBLIC		10.9	1.3
ESTONIA	36.9	13.7	3.2
LATVIA	32.6	15.4	3.8
LITHUANIA	31.1	6.5	0.9
ROMANIA	34.1	3.9	0.3
RUSSIAN FED.	27.5	11.6	0.4
SLOVAK REP.	44.8	10.7	0.8
SLOVENIA	36.9	9.5	0.8
UKRAINE	19.8	7.2	0.2

Source: monthly Institutional Investor, published in World Development Indicators, pp. 262–264; IMF's Balance of Payments Statistic Database, published in World Development Indicators, pp. 310–312

The cited evidence suggests that capital controls in Poland and other countries in the region have fallen significantly in the 1990s. The measures of financial integration show that Poland is not a long way behind some of the EU countries. Moreover, there is an opportunity for capital to be mobile, and – as other studies state – Polish economy experienced a surge in capital flows in the mid-1990s, and large capital flows are present.

### **1.2.3. Saving-Investment Puzzle**

Up to this moment two observations came clear from the review of the literature. First, saving and investment rates are correlated. Second, capital in the EU – and more recently in the CEECs – tends to be more and more internationally mobile. These two facts, that were originally thought to contradict each other, gave rise to the whole class of theoretical explanations of this paradox.

Several authors have proposed models built on the assumption of perfect capital mobility, in which saving and investment were correlated because they both reacted to common conditions [Artis and Bayoumi, 1990]. The paper of Baxter and Crucini (1993) is an example of such theoretical explanation on the subject. The authors construct a two-country, one-good version of the standard neoclassical model, where labour is immobile, firms are subject to exogenous productivity shocks, and markets are complete, which means that agents may trade any contingent claims they wish. There are no restrictions on opportunities for international risk pooling, and country size is captured by the population size.

The analysis starts from the assumption that capital is highly mobile, and then examines the other components of the model and relationships among them. The correlation between basic saving – defined as national output minus the sum of private and government consumption – and investment depends on the correlation between output and investment, the correlation between consumption and investment, the volatility of consumption relative to output, and the volatility of output relative to basic saving. As an effect, positive correlations between saving and investment come as a robust prediction of this quantitatively restricted model. Moreover, the model correctly predicts that these correlations are higher for larger countries.

Another set of arguments, opposing the claim that saving-investment correlation tests the mobility of capital, offers the proposition that governments may have targeted the current account. Artis and Bayoumi (1990) present an estimation of government reaction functions for industrialised countries. Reasonably stable monetary policy reaction functions were identified for several of them. The analysis showed that the current

account was a policy target in the 1970s, and that its importance declined in the 1980s, which would suggest falling saving-investment correlation. Next section of the paper address the problem of what was the behaviour of saving and investment rates in Europe, and how strong this correlation in Europe has been.

### **1.3. National Saving and Investment – Empirical Evidence**

The empirical part of this paper focuses on answering the question whether saving and investment ratios in Europe are indeed correlated, and whether it implies a low mobility of capital in the area. The present study aims at analysing this paradox for Poland, but since the long time series data are not available here, the work has a comparative approach to the subject. The S-I relationship and the actual – and potential – capital flows are analysed separately. The investigation covers 13 EU countries, together with Polish and Hungarian data from the 1990–1995 period. The analysis starts from the review of time paths of saving and investment rates in Europe during the last three decades.

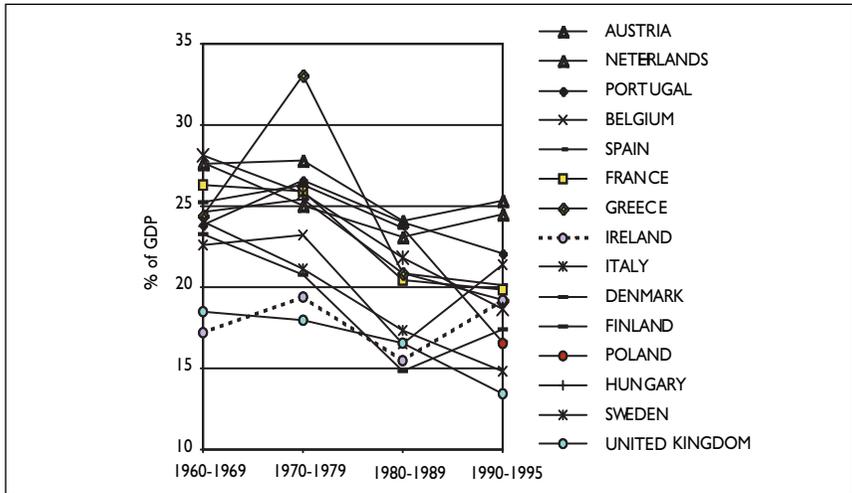
#### **1.3.1. Empirical Examination of Average Saving and Investment Ratios**

Figures 1 and 2 show the evolution of average saving and investment rates during the last three decades. The investment rate is defined as a ratio of gross fixed investment to GDP, and the saving rate – as a ratio of gross saving to GDP. The saving and investment rates were calculated at the annual frequency, and then averaged for the 10 and 6 years periods. There can be seen a general downward trend both for the average saving and for the average investment ratios. The investment rates were varying from 19% to 34% in the 1970s, from 17% to 31% in the 1980s, while in the 1990–1995 period these threshold values went down to 15% and 27%, respectively. The equivalent values for the saving ratios went down from the 17% – 28% range in 1960s, to 13% – 25% range during the years 1990–1995.

Portugal has recorded the highest investment ratios through all the period (34% in the 1970s, 27% during the years 1990–95). Spanish and Greek investment rates have also been among the highest in Europe. Greece experienced the highest "peak" in the average saving rates in the 1970s (33%).

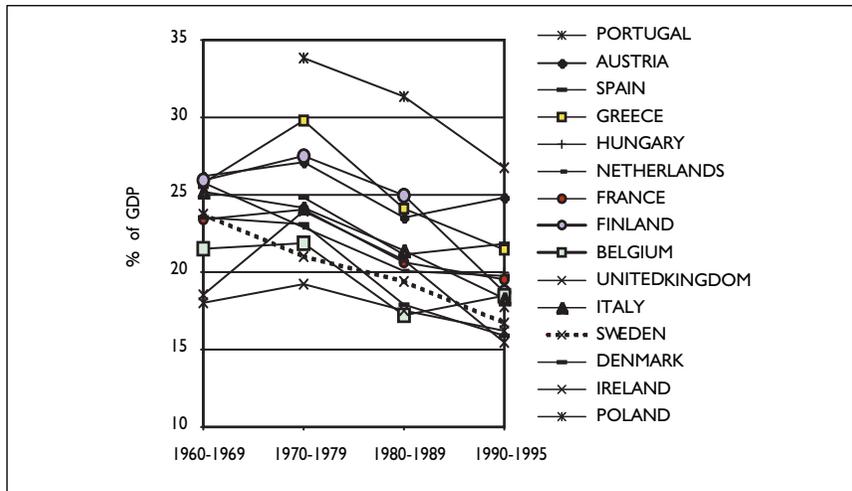
Polish (17.8% of GDP) and Hungarian (19.9% of GDP in years 1991–1995) investment rates are located in the middle of the sample distribution of average investment rates of 13

**Figure 1. Average saving ratios, 1960–1995**



Source: OECD Economic Outlook Database

**Figure 2. Average investment ratios, 1960–1995**



Source: OECD Economic Outlook Database

EU countries in the years 1990–1995. The same cannot be said for their saving rates, which – during this period – are relatively low when compared to the EU data from early 1990s.

Both Polish and Hungarian investment rates are similar in respect to their magnitude to the average investment rates for the majority of the European Union members during the years 1990–1995. However, giving the needs of these newly opened economies, and the behaviour of investment rates in the South European countries during the last three decades, it is highly possible that Eastern Europe will encounter growing investment rates in the next years. It is more difficult to assess, at this stage, the future adjustment of domestic saving rates in the region.

### **S-I cross sectional correlations in the EU**

The following part of the analysis is devoted to the examination of the saving-investment correlation.

Table 2 shows the saving-investment correlations, expressed as a coefficient of the Feldstein-Horioka type regression (eq. 1). The results of the cross-sectional estimation for 11 European countries, for which the data were available are listed in the first column. The sample consists of data on Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, the Netherlands, Sweden, and UK. The coefficient values have been systematically falling from the 1960s. The estimate had a value of 0.74 for the period 1960–69, then 0.61 during the next decade, and 0.51 for the period 1990–1995.

**Table 2. Relation between domestic saving ratios and domestic investment ratios, 1960–1995**

Sample period	11 observations			13 observations		
	Constant	S/Y	R2	Constant	S/Y	R2
1960–69	5.63	0.738744	0.83			
1970–79	9.28	0.610487	0.74			
1980–89	9.26	0.585504	0.58	5.22	0.817232	0.53
1990–95	8.42	0.535884	0.51	6.52	0.669855	0.45

All estimates refer to equation 1 in the text. The variables were averaged for the sample period indicated.

The similar analysis was performed for the period 1980–1995, with the sample enlarged to cover additional data on Spain and Portugal. The estimate for 1980s had the impressive magnitude of 0.82, while for the period 1990–1995 it went down to 0.67.

The "savings retention" coefficients have been falling during the years 1960–1995 and 1980–1995, suggesting that the saving-investment correlation in Europe has been

going down. However, the exact magnitude of the coefficients was found to be very sensitive to changes in the actual countries included in the sample, indicating possible large inter-country differences in the saving-investment correlation.

### **1.3.2. Time Paths of Saving and Investment for CEECs**

Since it was postulated that individual country studies can shed some light on the nature of saving – investment correlation, here follows the analysis of saving and investment over time.

Polish data on saving and investment rates are discussed first. For the sake of comparison, the analysis includes also a brief overview of relevant Czech, Hungarian, Slovenian, and Estonian data. Table 3 shows the magnitude of saving and investment rates during the period 1991–1997.

It can be seen that Polish investment rates, depressed during the 1992–1993 period, begun to increase, and an excess of investment over saving has been recorded since 1996. The investment rate reached the value of 22% of GDP in 1996, being at a level comparable to the average investment ratios recorded for the Southern European countries in the early 1980s. The domestic saving rate has significantly risen during the 1990s.

Hungarian investment ratios have been rising from 1993, although year by year at a slower rate. The saving rate, which was falling during the 1991–1993, begun to rise in 1994, and from 1996, its distance from the rate of investment has accounted only for 2% of Hungarian GDP. The growth of S rates in Hungary has been more pronounced than in Poland during last years. Even though Hungarian savings in 1993 were only around 10% of GDP, they managed to increase considerably in the next four years accounting for 23% of GDP. Unlike Polish, Hungarian investment rates have been exceeding domestic savings from 1991, and their relative magnitudes in 1996 and 1997 were slightly higher (25% of Hungarian GDP).

There are some similarities between Polish and Czech saving and investment rates. Czech investment rate, falling until 1993, rose in the next year to 20% of GDP, and has been increasing since, at a stable rate. Saving rate, depressed prior to 1994, started to rise from 1995 on, but the growing domestic resource gap has been recorded since 1995. The main difference between Czech and other Central European investment rates laid in their relative magnitudes. While Poland recorded investment at 22% of GDP in 1996, Hungary at 25%, Czech investment rate approached 35% in 1996. This was exceptionally high even for EU countries in the 1990s, and resulted in the domestic resource gap of 8% of Czech GDP in 1996.

**Table 3. Polish, Hungarian, Czech, Slovenian, and Estonian gross saving and investment ratios as a percentage of GDP, 1991–1997**

	1991	1992	1993	1994	1995	1996	1997
<b>Poland:</b>							
Gross domestic saving rate <sup>a</sup>	15.9	15.4	15.8	20.2	21.4	20.9	21.0
Gross investment rate <sup>a</sup>	19.9	15.2	15.6	17.7	19.8	22.0	24.7
FDI as a percentage of domestic investment <sup>e</sup>	2.0	5.0	13.0	10.9	14.8	16.5	16.1
<b>Hungary:</b>							
Gross domestic saving rate <sup>b</sup>	18.1	15.3	10.6	14.4	20.4	22.4	23.4*
Gross investment rate <sup>b</sup>	20.6	16.1	20.0	22.2	24.1	24.5	25.4*
FDI as a percentage of domestic investment <sup>b</sup>	21.4	24.7	30.5	12.5	41.4	18.2	
<b>Czech Republic:</b>							
Gross domestic saving rate <sup>c</sup>	36.84	27.45	20.23	20.11	23.31	26.91	
Gross investment rate <sup>c</sup>	29.89	27.07	18.39	20.37	27.81	34.52	
FDI as a percentage of domestic investment <sup>d</sup>			11.39	11.96	19.57	7.57	
<b>Slovenia:</b>							
Gross domestic saving rate <sup>c</sup>	26.42	24.73	20.61	23.16	21.89	22.24	
Gross investment rate <sup>c</sup>	20.61	18.41	18.73	19.75	21.20	22.09	
FDI as a percentage of domestic investment <sup>c</sup>			4.47	4.33	4.06	4.35	
<b>Estonia:</b>							
Gross domestic saving rate <sup>c</sup>	34.48	32.75	22.18	18.29	18.19	14.08	
Gross investment rate <sup>c</sup>	20.93	21.03	23.93	26.59	25.62	24.81	
FDI as a percentage of domestic investment <sup>c</sup>		7.06	15.63	19.21	18.81	12.94	

Source: a: GUS: SNA, b: IMF Staff Country Report No. 97/104, c: World Development Indicators, d: own calculations based on IFS and WDI databases; e: Liberda (1998) and own calculations based on GUS SNA; \*IMF estimates

The domestic resource gap has been observed for Estonia since 1993, and it amounted to over 10% of Estonian GDP in 1996. Extremely high saving rates have been falling year by year since 1991, and in 1996 domestic savings were at 14% of GDP. Estonian investment rates increased between 1992 and 1993, and fluctuated around 25% level since then.

Slovenian saving rates stayed above 20% of GDP through 1991–1996. Although there was a decrease during the first two years, it did not continued, so saving rate was at 22% of Slovenian GDP in 1996. Contrary to the preceding examples, Slovenian investment rates have never been higher than saving rates, although the difference between the two became very small in the second half of the 1990s.

### **Comparison with some EU countries**

Cointegration analysis of investment and saving rates in the EU reveals, that there does not seem to be any general trend concerning long-run relationship between the two values for the European Union countries during the period 1960–1995 [1]. The individual country time series analyses have found some cointegrating relations between saving and investment rates, but for the majority of them, cointegration was rejected. Moreover, for some of the countries for which investment and saving were found to be cointegrated, the long-run relationship was found to be negative – like in the case of Spain – while for some other it was positive.

These results contrast with outcomes obtained by Bayoumi (1989), who found a close correlation between saving and investment over time for nine over ten industrial countries. He reports coefficients not significantly different from unity, but significantly different from zero. However, other authors argue [after Artis and Bayoumi, 1990] that the inclusion of even the late 1980s period significantly reduces estimated correlations.

Because it was not possible to test the saving-investment correlation over time using econometric tools, further analysis focuses on visual examination of country specific information. The so-called "Southern countries" were chosen as points of reference for CEECs data. First, it seemed useful to find a base for comparisons. Second, since these countries of Eastern and Central Europe have been making preparations to join the EU in the future – while being significantly weaker economic partners – it is interesting to examine the time path of the relatively poorer economies of the EU, that become the Community members. In terms of "outside" environment and some macroeconomic condition the current situation of Poland, Hungary, Czech Republic, Slovenia, and Estonia somehow resembles the "Community southern frontier". Ireland was also added to the sample, as an example of successful integration.

The poorer EU economies of Portugal and Greece [2] have been characterised by the excess of investment over saving from the early 1980s (and even earlier in the case of Portugal). The largest "domestic saving" gaps of around 10% of respective country's GDP were present in the 1980s. Similar situation of an excess of investment over saving causing the large "domestic resources" gap in the 1980s has been also typical for Ireland until the last decade.

Data on Portugal and Greece suggest that Portuguese and Greek saving and investment ratios have exhibited much more year-to-year volatility than respective indicators for other EU countries. While yearly changes of saving and investment

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[1] For two countries, for which earlier data were not available, sample started from the year 1970 (Spain) or 1977 (Portugal).

[2] As measured by GNP *per capita*.

ratios for these economies have been quite substantial, the stable EU countries recorded balanced S and I rates [3], fluctuating in the long-run around its mean values. Moreover, Portugal, Greece and Ireland experienced in the early 1980s period of exceptionally high investment rates, which have significantly fallen since then. This high investment was financed by the resource inflows from abroad.

The capital controls are still present in these economies (except for Ireland), and gross private capital flows reflect this fact (see Table I). As it was already mentioned, the relative stage of Polish, Czech, and Hungarian financial integration into world capital markets is not very distinct from those of some of the South European countries. Estonia and Slovenia also follow the same path. Therefore, it can be expected, that as these Central European economies become more stable and more opened, the risk associated with an investment falls, and that given sufficiently strong domestic demand, some of the domestic investment should be financed by the resource inflows. Thus we can expect, that CEECs investment rates will outweigh domestic saving, further causing "resource gaps" that have been observed for the majority of them since mid-1990s.

#### **1.4. FDI in some EU and CEECs**

The "capital gaps" are filled up with foreign resources. It is postulated here, that foreign direct investment is very important component of capital flowing from abroad, and its importance is especially valid for transitional economies of Eastern Europe.

The "domestic resource gaps" observed for the "Southern" EU countries in the 1970s and in the 1980s, have been financed by foreign investment inflows, from which foreign direct investment (FDI) played the most important role. Taking together, the flows of foreign direct investment coming to the southern Europe increased sharply in the late 1980s and the early 1990s. This increase was caused mainly by direct investment flowing to Spain and Portugal.

The 1990s brought about a decline of direct investment funds coming to the "southern" Europe. On the contrary, the newly independent states of Central and Eastern Europe started to attract FDI. FDI flows have been increasing for Hungary, Poland and Czech Republic, as shown on the Figure 3 [4]. There are also significant flows coming to Russia (\$ 2,452 millions in 1996, \$ 6,241 millions [5] in 1997: World

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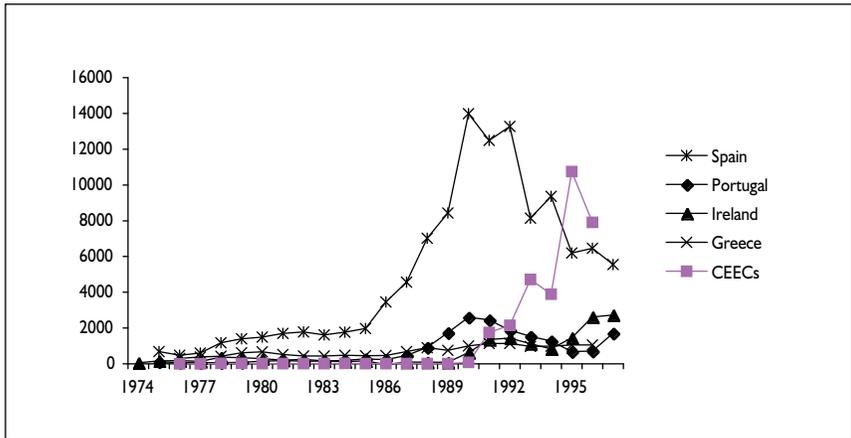
[3] Only in the case of Switzerland and Netherlands domestic saving rates have been significantly higher than the respective investment rates.

[4] CEECs Figure 3 stays for: Poland, Hungary and Czech Republic.

[5] Estimate.

Investment Report, 1998). Eastern and Central Europe attracted, as a region, 3.6% of the world FDI inflows in 1996, and 4% in 1997 [World Investment Report, 1998].

**Figure 3. FDI inflows (in millions of US dollars), 1974–1997**



Source: IMF International Financial Statistics

While FDI in Hungary is located mainly in the electricity and water distribution sector, the trade sector, and in machinery and equipment (14%, 12%, and 12% of total FDI in 1997), it comes primarily into food beverages and tobacco, finance, and machinery sectors in Poland (21%, 21%, and 17% in 1997), into transport, storage and telecommunication, food beverages and tobacco, and automotive sectors in Czech Republic, and into finance and mining industry in Russia [World Investment Report, 1998].

Since 1996 domestic resource gap in Poland has been almost fully financed by foreign direct investment according to some of the FDI calculations [Liberda, 1998]. Hungary and Estonia experienced an excess of investment over saving since the beginning of the 1990s, Czech Republic since 1995, and relatively significant FDI inflows have been present in these economies since this time.

### **To what extent is FDI inflow beneficial for the host country?**

FDI inflows can contribute to the rate of growth of the host country in two opposite ways. Even if FDI raises the level of national income, it can have opposite impact on its growth rate. Caves (1982) writes that these effects usually occur through saving rate. It is possible that foreign investment raises government savings through tax revenues thus raising saving rate. But it can also be true that such inflow reduces the private sector's rate of saving and thus the growth rate. Since saving rate in Poland

is below those for developed countries, its further growth is desirable.

The concern that domestic savings may be depressed as a result of FDI inflows have been widely discussed in economic literature, especially in the reference to low developed countries (LDCs). Caves (1982) provides possible explanations on a micro level. When foreign capital comes into a relatively capital scarce country, it usually lowers its rate of return. This means that the rate of return to domestic savers can also be lowered, and so the rate of saving. Alternatively, FDI may raise a return to domestic labour, lower the return to domestic capitalists, and lower the saving rate if only capitalists save. Caves (1982: 273–274) presents empirical evidence on LDCs in the 1970s which proves that too much capital inflow from abroad relative to domestic investment reduced saving. Sometimes, depressed saving rates can result from the foreign direct investment which is highly competitive with the domestic investment [Liberda, 1998].

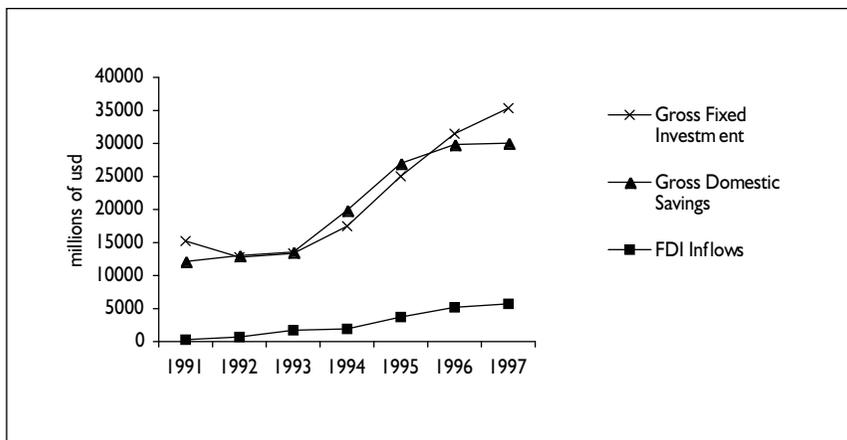
On the contrary, FDI can append to the productivity growth in the host economy, due to favourable external effects. Then, domestic investors profits can increase, and so the saving rate. Because there exists alternative theoretical predictions about FDI's impact on domestic savings, so there is a need to examine it empirically.

### **How much of FDI can Polish economy absorb?**

It can be seen from the Figure 4 that since 1994 FDI flows have been growing form year to year by considerable amounts. During 1997 the inflow of foreign direct investment coming into Poland reached over 5 billion dollars, which amounted to 4% of Polish GDP. During this period, domestic savings – that have been rising till 1995 – stopped growing and stabilised at 21% of GDP.

Examples of Hungary, Czech Republic, and Estonia are clearly different in this respect. As can be seen from Figure 9 in Appendix, distinct situation took place in Hungary. While it is possible that the sharp growth of FDI inflows in 1995 slightly lowered the 1996 Hungarian saving rate, the saving rate itself has been growing steadily since 1993. Unlike in Poland, there has been no clear slowdown in the growth of domestic savings since 1995. So it is hard to asses whether fluctuations in FDI inflows have had any effect over Hungarian rate of saving. Domestic savings in Czech Republic (Figure 10 in Appendix) have been growing since 1994 irrespective of speed of FDI inflows. Estonian saving rates have been falling through mid 1990s while FDI inflows have stayed high.

From 1993 to 1995, higher FDI inflows from year to year occur together with rising saving rate in Poland. This suggests that foreign direct investment coming here – and located mainly in food and financial sectors – was associated with substantial positive external effects. However, saving rate in Poland stopped to grow in 1996, and

**Figure 4. Gross savings, gross investment, and FDI inflows in Poland, 1991–1997**

Source: Liberda (1998), GUS (1999)

still growing FDI inflows may be seen as one of the factors preventing the saving rate from further augmentation.

## 1.5. Conclusions

Relations between domestic saving and investment rates, and their implications, have been extensively investigated in economic literature. Various studies show that savings and investments are correlated in the cross-sectional regressions, but it is hard to find a clear evidence of this high correlations at the individual country level.

The empirical analysis performed here shows that saving and investment rates have been indeed correlated in the EU during the last three decades, although the strength of this correlation has declined. Relations between domestic savings and investments for individual countries have been of different kinds. Data on S and I rates for the – so called – Southern European countries show that domestic resource gaps have been present there in the 1980s.

Transitional economies of Central Europe experienced a decline in their investment rates at the beginning of the 1990s. The process usually did not last longer than two years, and the following period brought significant increase in investment rates in the region, together with the growth of saving rates. However, an excess of

investments over domestic savings since the mid-1990s has been recorded in Poland, Hungary, Czech Republic, and Estonia, indicating large capital inflows.

The last decade brought also the reorientation of the foreign direct investment flows. While FDI flows coming to the Southern Europe have been growing in the 1980s and early 1990s, a decline of direct investment funds coming there was observed in the next years. On the contrary, the newly independent states of Central and Eastern Europe started to attract FDI. It is argued here, that FDI coming to CEECs is playing very important role in financing domestic investment. As examples of Poland and Estonia show, it is possible that quickly growing FDI inflows might lower domestic saving rates in the region or eventually hamper their further growth. However, data on Hungary and Czech Republic do not confirm this hypothesis.

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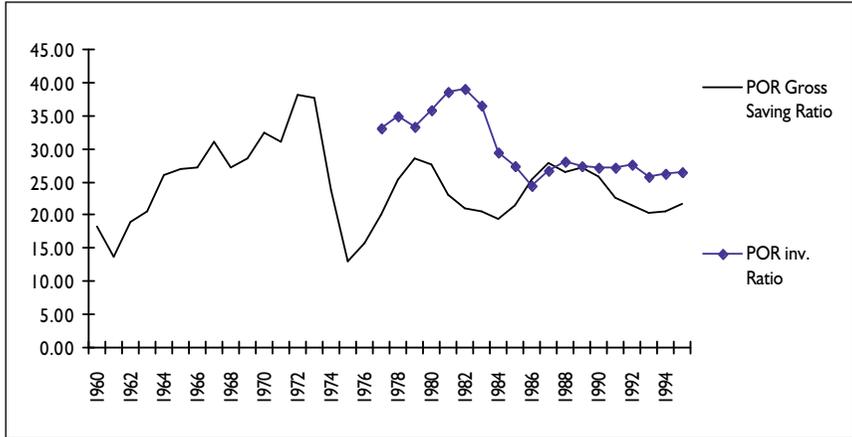
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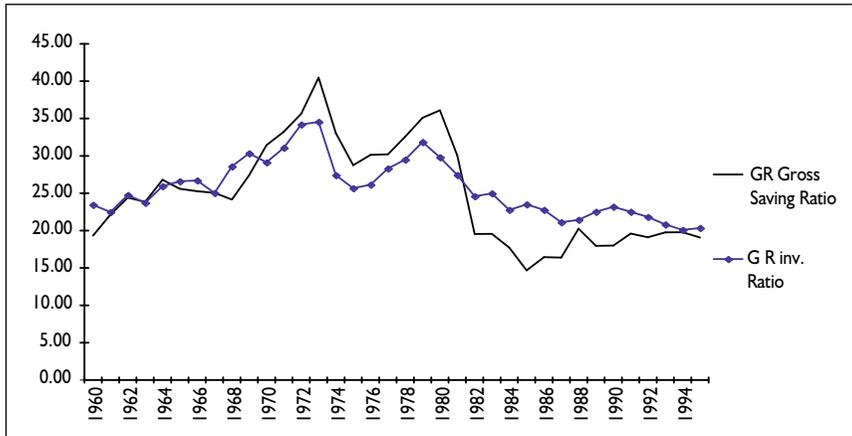
## Appendix: Saving, Investment and FDI for Selected Countries

Figure 5. Portuguese S and I ratios, 1960–1995



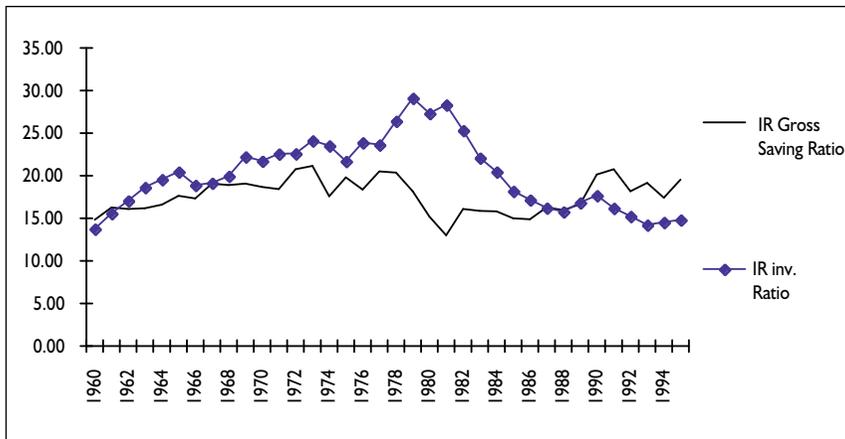
Source: OECD Economic Outlook Database

Figure 6. Greek S and I ratios, 1960–1995



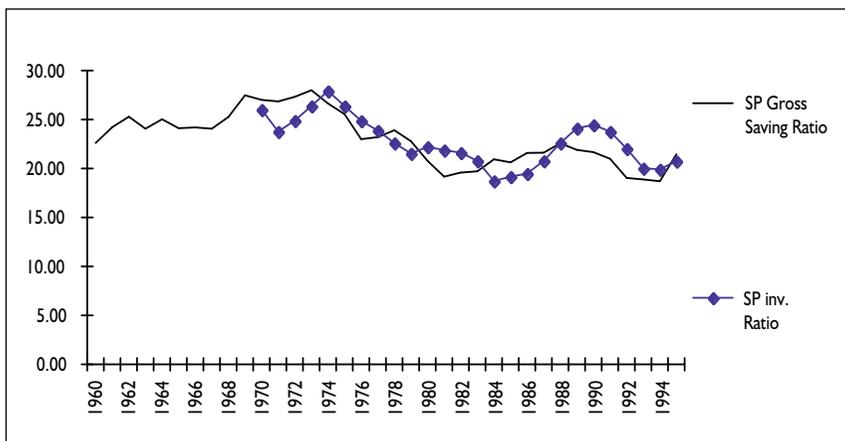
Source: OECD Economic Outlook Database

**Figure 7. Irish S and I ratios, 1960–1995**



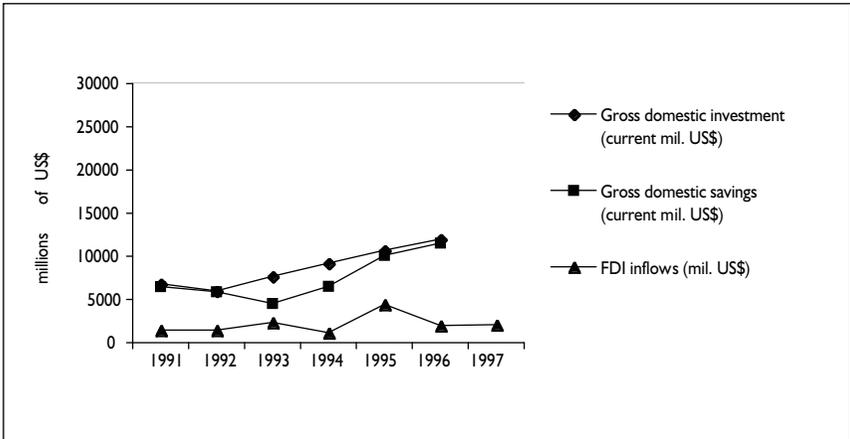
Source: OECD Economic Outlook Database

**Figure 8. Spanish S and I ratios, 1960–1995**



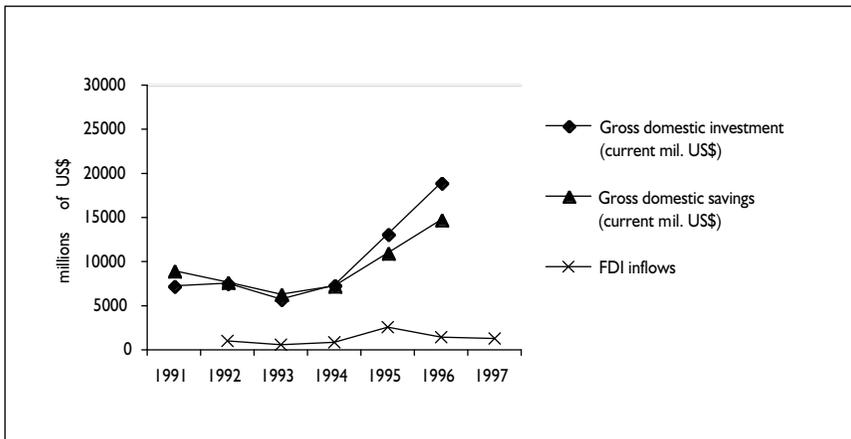
Source: OECD Economic Outlook Database

**Figure 9. Gross Savings, Gross Investment, and FDI Inflows in Hungary, 1991–1997**



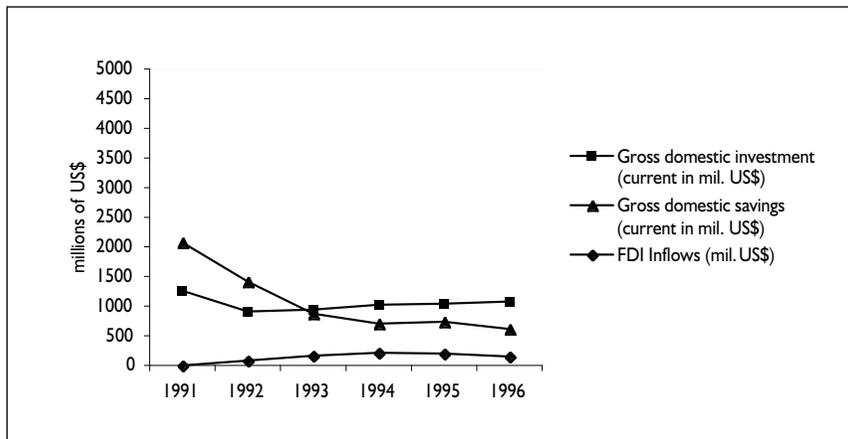
Source: World Development Indicators 1998 and World Investment Report 1998 (FDI)

**Figure 10. Gross Savings, Gross Investment, and FDI Inflows in Czech Republic, 1991–1997**



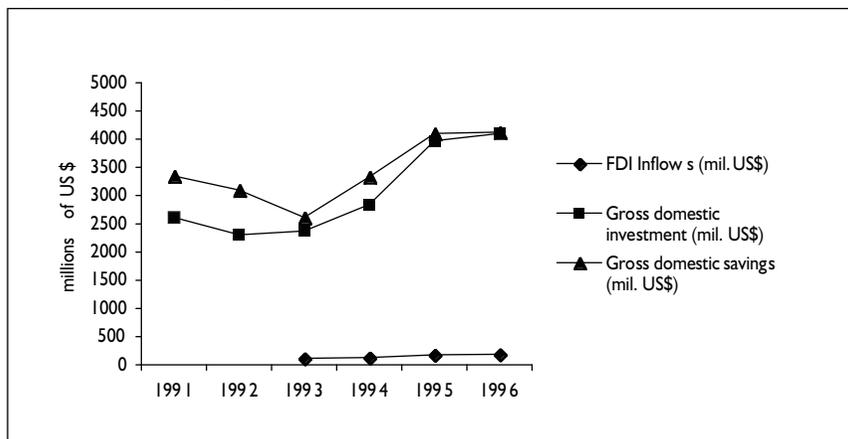
Source: World Development Indicators 1998 and World Investment Report 1998 (FDI)

**Figure 11. Gross Savings, Gross Investment and FDI Inflows in Estonia, 1991–1996**



Source: World Development Indicators 1998 and World Investment Report 1998 (FDI)

**Figure 12. Gross Savings, Gross Investment, and FDI Inflows in Slovenia, 1991–1996**



Source: World Development Indicators 1998 and World Investment Report 1998 (FDI)

## **Part 2. The Interactions between Private Savings and Government Budget Deficit**

**Joanna Siwińska**

### **2.1. Introduction**

The goal of this paper is to assess theoretically as well as empirically the influence of government budget deficit of private saving rate, with special emphasis on Poland and other transition economies. It is organised as follows: Section II discusses the theoretical aspects of the influence of fiscal policies on private savings, Section III outlines empirical results from the literature and Section IV develops implications for transition economies. Section V concludes.

The saving rate is one of the most important variables in economy. Saving rates and economic growth are strongly positively correlated. Although what induces what still causes hot debates, most economist agree, that there exists a virtuous cycle, in which higher saving causes faster growth and that causes even higher saving.

Savings are undoubtedly a necessary condition for capital accumulation and to extend that domestic saving and investment rates are correlated, higher domestic saving rates will imply higher investment. However, in an open economy, where capital is highly mobile, domestic saving and investment may be totally uncorrelated. If that is the case, the increase in the former may not be transmitted into higher investment.

If however, the degree of capital mobility is limited, domestic saving will be an important factor generating higher domestic investment.

Higher investment may imply higher growth, but again, economists do not fully agree on the implications of the increased investment on growth.

Neo-classical theories (Solow growth model) suggest that increase in the level of saving will generate higher growth only in the short run, during the transition to a new steady state, with higher per capita GDP. The new growth theories predict that higher saving rates and the related increase in capital accumulation can result in a permanent increase in growth rate.

Therefore the level of domestic savings may or may not have an impact on growth, but it probably does have an impact on one of the most important economic variable: the level of GDP per capita.

Fiscal policy is among the factors that exert influence on the level of domestic savings. Understanding the mechanisms of this impact and being able to predict the reaction of private and hence the national saving rate to changes in fiscal policy would give a powerful

tool for increasing and encouraging domestic savings. This is especially relevant today, when saving rates have declined and are expected to decline further, as the population ages, what raises questions about issue of the saving shortfall.

## **2.2. Theoretical Considerations**

Budget actions influence the level of national savings. In a purely accounting sense, fiscal policy alters to the level of national saving by changing the amount of government (dis)saving. Its direct impact on national savings is however much more complex, as the level of budget deficit and public debt, as well as the composition of government expenditures and revenues, may cause a shift in the level of private savings [1]. Therefore, the effect of fiscal policy on the level of national saving cannot be determined only by looking at the change in government savings; one has to take into account also the induced change in private savings. However, despite a voluminous research on this subject, it is not clear either from theoretical as well as empirical ground, how exactly private saving rate reacts to public deficit and the method of its financing.

The Ricardian-Barro Equivalence Theorem and the Neo-classical view give the theoretical predictions concerning the direct impact of budget actions on private savings.

The Ricardian-Barro Equivalence Theorem holds, that any tax-induced change in government budget deficit/surplus will be exactly offset by a change in private savings and level of national savings will be unchanged. The substitution of current taxes by budget deficit has no impact on private consumption decisions, interest rate and national savings [Barro, 1989].

The Neo-classical view predicts that a permanent deficit will not increase private savings because it will induce households to consume more. Therefore national saving ratio will fall. A temporary budget deficit may indeed not have an adverse effect on national savings, but through a different channel, than predicted by Ricardian Equivalence Theorem [Bernheim, 1989].

These opposite predictions stem mainly from the fact, that both theories have different views on the issue, whether the issuance of government debt will be perceived by households as an increase in their wealth or not. The Ricardian approach assumes, that government debt is not treated as net wealth, while the Neo-classical approach holds that

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[1] Fiscal policies influence private savings also indirectly, through their impact on the real interest and exchange rates, and therefore on the income and substitution effect. The budget deficit can also change the private saving ratio through its effect on inflation, that if big enough, might discourage people from money savings and cause a flight into durable goods.

the opposite – that government debt will be viewed as increasing the households' net wealth.

To clarify this issue, let's consider a tax-cut induced rise in budget deficit covered by issuing additional debt. The Ricardian-Barro Equivalence Theorem holds that because people are fully rational and farsighted, they will recognise that the government will have to repay today's debt by raising taxes in the future. Therefore today's tax decrease implies future tax rise equal to the present discounted value of the issued debt. Because households try to smooth the consumption pattern, they will save the current tax rebate to cover the future expected tax increase. Debt is recognised as merely a postponing of taxes and does not alter individual's net wealth and lifetime budget constraint in any way. The maximisation problem is not changed. The only thing that changes is individuals' saving behaviour: because disposable income is temporarily increased by the postponing of taxes, but consumption is unchanged, agents save the additional income when government issues debt, in order for them to pay the future tax liabilities. The time pattern of financing the deficit (the debt/tax mix) is irrelevant.

A crucial assumption needed for the Ricardian Equivalence Theorem to hold, is that households behave as if they lived forever and thus it does not matter when taxes will be risen to pay for the debt: in the near future or during the lives of next generations. This problem was solved by Robert Barro [Barro, 1974], who showed, that this assumption will be satisfied, if one takes into account, that people usually love their children. It is then plausible, that the utility of the next generations has the same value for the individuals as their own utility: individuals treat children as extensions of themselves. If this is true, then people will save the additional income from tax decrease, even if they expect, that the taxes will not be increased during their lifetime, but during the lifetime of their children.

On the other hand, the Neo-classical approach holds that the time pattern of financing the deficit does matter. This approach assumes that economy consists of overlapping generations that plan consumption over own life cycle, with little or no altruistic behaviour. Individuals recognise that a tax-cut-induced rise in budget deficit must be eventually paid off by an increase in future taxes. If however the burden of the debt is expected to be borne by future generations, then the expected future tax increase will not induce any offset in private saving. Contrary, consumption will rise and private saving may fall. Because individuals do not expect pay the future higher taxes themselves, they perceive a tax-cut induced budget deficit and government debt as increasing their wealth.

In the short run, if the deficit is temporary and some resources are unemployed, then the increased consumption will raise national income. Since both consumption and income is stimulated, the effect of a temporary deficit on savings need not be perverse. However, if large numbers of consumers are liquidity constrained, then even a temporary

deficit will depress saving rate, as for such consumers the propensity to consume out of additional resources is one.

If however the change in deficit is permanent and economic resources are fully employed, that the increased consumption necessary implies depressed private savings.

The main underlying cause of the different predictions of the two views is the assumption concerning the intergenerational altruism and the strength of bequest motive, while the underlying permanent income/life-cycle hypothesis, widely accepted for the analysis of household choice, is incorporated by both approaches [Seater, 1993]. The extreme Neo-classical model holds that individuals have no bequest motive. Individuals care only about their own consumption and therefore will leave no bequest. Therefore if the tax increase needed to repay the debt is expected to be levied on the future generations, current generations will not increase their savings for the purpose of paying future taxes.

The extreme form of the Ricardian-Barro Equivalence Theorem holds, that the bequest motive is so strong, that individuals act as if they lived forever. In this case, a tax cut would induce increased savings in order to smooth down consumption over time, irrelevant of whether it is their own or their heirs. The increased savings are passed as a bequest to future generations, in amount sufficient to pay for the increased taxes.

The Ricardian Equivalence, although intellectually interesting, requires the following assumptions, apart from the already discussed precondition of the existence of intergenerational altruism and bequest motives [Seater, 1993]:

- there are no liquidity constraints,
- there is no uncertainty,
- the individuals and government have the same borrowing rates,
- there is no distribution effects,
- no differential between the interest rate and the GDP growth rate exist,
- consumers are rational,
- there is no distortive taxation.

Those assumptions are strong and it does not seem possible that they are likely to hold in real world. The main arguments raised against their validity are the following. First of all, although without doubt most parents care about their children, it is impossible to assume that the bequest motive will be strong enough to balance government dissavings with private saving increase. If altruism had been sufficiently important to induce Ricardian Equivalence, than it would have also caused some rather implausible results. Because family linkages form complex networks, then strong altruism would link all families together and then all redistributive policies would be irrelevant, including tax rates. Since this is not observed, the fundamental assumption must be wrong [Bernheim, 1989].

Second, many households, especially in developing and transition economies are liquidity constrained, and therefore would be pleased to have their current taxes reduced and to increase consumption, even if that means paying higher taxes and consuming less in the future.

Third, distortionary taxation and uncertainty over future tax burdens and income streams imply that fiscal policy may not be neutral.

Another argument raised against Ricardian Equivalence Theorem is that not all people are rational and forward looking. Myopia, rules of thumb, habit may be important at least for part of the population and therefore these persons might not include the connection between current debt and future taxes into their budget constraint.

The Neo-classical prediction concerning the effects of deficit does not require such strong assumptions. Although its strict version also assumes fully rational consumers, who solve the intertemporal optimising problem and no liquidity constrains, violation of those assumptions does not significantly alter the results. It even strengthens the hypothesis concerning the non-neutrality of debt, as the introduction of liquidity constraints implies, that temporary deficits will have immediate negative effect on spending [Bernheim, 1989].

For those and other reasons, most economist dismiss the strict Ricardian Equivalence, but many believe, that the true effect of the government deficit on the private savings lies somewhere between the predictions of both schools. This implies that a fall in government savings would be partly offset by an increase in private savings and the strength of the reaction is an empirical question.

Apart from the relevance of the tax/debt mix on the patter of private savings, another interesting aspect of the government policies is the influence of specific public spending policies on private savings. In particular, in the Ricardian-Barro framework, it is argued, that government expenditures in the forms of investment as opposed to consumption/transfers should have different effects on private saving [Hutchinson, 1992]. Private saving should respond much less to a deficit financed government investment, that to a rise in consumption or transfers. The reason is, that investment is expected to earn profit and to pay for itself, therefore corresponding tax increase should be reduced.

There also might exist a link between private savings and a tax-financed government consumption (i.e. the government budget is held constant). If the public does not value government consumption, i.e. it is not a substitute for private consumption, savings will probably decline. If however government consumption is a close substitute for private consumption, then private savings may not decline.

When surveying the impact of public finances on private savings, one cannot forget about the impact of the public social security system [Hutchinson, 1992]. A rise in total budget surplus associated with a rise in current social security balance may have quite

different effects than a rise in other budget components. It is argued that if social security is viewed as a fully funded system, than a rise in the social security surplus may in a large part substitute for private saving targeted for retirement. On the other hand, if the system is viewed as a PAYG system, than a rise in the social security surplus may have only little effect on the private saving, because the present contributions are not directly linked to future retirement benefits.

### **2.3. Empirical Results from the Literature**

Existing research on the correctness of the Ricardian versus the classical view is largely inconclusive. Some researchers dismiss the Ricardian Theorem, while the others provide a support to a weak Ricardian Equivalence (i.e. the deficit-induced change in private saving is less than one). The Ricardian -supportive research also indicates, that the extend with which private savings offsets the fall in government savings does vary from country to country and through time, and depends on institutional characteristics of the economy.

The existing evidence arises from the tests on the influence of the level and composition of public deficit on consumption, interest rate and private saving rate.

Below I summarise the more interesting work, which I have come across.

Kormendi (1983) surveys the effects of government policy on private consumption. He estimates a private consumption function, which main explanatory variables are: net national product, government receipts (taxes), net interest payments made by government, total government transfers payments, government purchases of goods and services, market value of the stock of government debt, net private wealth and corporate retained earnings [2]. Such specification allows him to test what he calls a standard approach and consolidated approach. The standard approach assumes that the private consumption depends on personal disposable income (defined as national product less taxes, retained earnings plus transfers and government interest payments) and wealth plus government debt. Therefore, this approach incorporates the discussed neo-classical proposition, that the private sector treats the public debt a net wealth and ignores its effect on future taxation. In the standard approach, Kormendi also includes the proposition, that the private sector ignores the benefits of government spending. If this approach is correct, then the relation between private consumption and taxation will be

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[2] Equation 5 in Kormendi's text.

negative and government debt transfer as well as government interest payments will have a positive impact on consumption.

The consolidated approach – incorporating the Ricardian hypothesis, but more general than its strict version, proposes, that the choice of debt vs. tax financing leaves the private consumption unchanged and also that government consumption does have an effect on private consumption. If this approach is correct, the estimation should yield, that government consumption affects private consumption negatively and that the stock of government debt, government interest payments, taxation and transfers do not affect private consumption-saving decision.

The estimation is done over the period 1930–1976 for USA, in first-differences of variables, using OLS. The results are mixed, but rather supportive of the consolidated approach: the coefficients of taxation and interest payments are insignificantly different from zero, what supports the Ricardian proposition. The coefficient of the government debt is negative, what is puzzling and not in line with any of the theories. This work has been perceived by many economists "as the strongest empirical evidence in favour of the Ricardian Equivalence" [Feldstein, 1990].

This research has produced a substantial amount of comments. Among them is the work by Feldstein and Elmendorf (1990). They argue that the evidence in favour of the Ricardian-Barro approach, given by Kormendi's paper is doubtful. They propose, that the estimated negative coefficient on government debt indicates, that the model might be misspecified. They also hold, that if one excludes the war years (a period of unusual nature of the market, because of shortages and rationing), it significantly changes the results and leads to rejection of Ricardian proposal [3]. They also argue, that instead of OLS, a more appropriate method should be used – first order autoregressive transformation and instrumental variable estimation is relevant. After incorporating all these corrections, they yield a result, that the coefficient on tax variable is generally negative and significant. Authors conclude, that Kormendi's conclusion is wrong, and the evidence contradicts the Ricardian Equivalence and supports the classical view.

Poterba (1988) studied the response to a 1975 tax rebate in the United States. He estimated a consumption function, where present real per capita consumption (in logarithms) was dependent on the consumption in previous period and a tax change, as a fraction of past consumption. Monthly consumption data was used. The results have shown, that consumption moved in the same way, as the tax-induced change in disposable income, supporting the neo-classical approach and constituting evidence against the strict Ricardian view, that the timing of taxes does not matter.

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[3] Although Kormendi estimated equations, that did omit the war years, he did not include in them taxes and government debt together.

A more recent work modelling the impact of government budget deficits on private savings is provided in the articles by Masson et.al. (1995), Edwards (1996) and Hutchinson (1992).

In the article by Masson et.al. (1995) the private saving rates were regressed on number of potential explanatory variables, like government budget surplus, government current expenditures and investment, growth rates of real output, consumer prices and terms of trade, the real short termed interest rate, GDP per capita, dependency ratio. It was done for 21 industrial countries for the period 1971–1993 and for 40 developing countries for the period 1982–1993.

The results of this research imply that for the industrial countries, private savings offsets around half of the change in the government budget, which is caused by tax changes. For developing countries the coefficient of the government budget surplus variable was larger  $-0.659$ . When however the sample of developing countries was divided into high, middle and low income countries, the results were different: for high income countries the coefficient of government budget was almost one ( $-0.940$ ), exactly in line with Ricardian Theorem, while for middle income countries it was  $-0.349$  and for low-income  $-0.673$ . The results for developing countries also indicate, that when the deficit is reduced by cuts in government investment spending, rather than increases in taxes, there is a smaller offset on private saving (except in the case of middle-income economies). The current government expenditure variable was not included in the developing country regression. In the case of developed countries, private savings reacts equally to the change in budget caused by taxes and investment spending, but reacts less, if government current expenditure is changed.

This research is therefore supportive of a weak form of Ricardian Equivalence, and indicates, that the results are probably different across countries, with a stronger Ricardian behaviour in developing countries. It also suggest, that different expenditure policies will have different implications for savings.

The research by Edwards (1996) was done on 36 countries. The dependent variable was private saving rate, among the explanatory variables were: government savings (but not mentioning whether changes were due to tax or expenditures shifts), age dependency, income growth, urban population, GDP per capita, money/GDP, real interest rate, current account, social security.

Edwards results suggests, that the coefficient on government savings is around  $-0.54$  for all 36 countries, and between  $-0.36$  and  $-0.65$  for LDC's, what gives support for a weak form of Ricardian Equivalence. The estimated coefficient on the social security

variable (variable defined as the ratio of public expenditure on social security policy to total public expenditures it is a proxy for expected social security benefits) provides some interesting insight as well; is negative and statistically significant, around  $-0.2$ . Edwards concludes, that reforms, that replace government run social security systems by a privately run will in the long run (after the transition period) increase private savings.

The work by Hutchinson (1992) is most comprehensive as far as the impact of fiscal policy is concerned. In his estimation, Hutchinson stresses the proposition, that private saving will react differently to specific expenditure policies and distinguishes between consumption and investment expenditures and also includes the social security variable.

In his model, the dependent variable is the private saving rate and the explanatory variables are: time trend, that captures other factors influencing private savings through time, percentage of elderly in the population (according to life cycle model, this should negatively influence the private savings), real income growth, tax-induced change in net government lending (without the social security fund), social security fund, government investment, tax financed (net lending is held constant), government consumption/ /transfers (including interest payments), tax financed.

To measure the effect of a debt financed government expenditure, one has to subtract the coefficient of net government lending from the coefficient on tax financed government expenditures.

The model was run separately for United States, Japan, Germany, United Kingdom and Canada, for the years 1960–1987. The methodology was cointegration and error – correction model. The results are summarised in Table 1.

The estimated long run private saving offset to a tax-increase-induced fall in net government lending (i.e. a deficit decrease) is quite high. In US, Germany and United Kingdom the estimates for government investment expenditures are larger than for other government expenditures. This indicates that in the long run a tax – financed rise in investment spending tends to be associated with a larger decline in private saving, that a rise in other categories of spending. This is consistent with the view, that a rise in investment spending would be expected to bring return and lower future taxes. However, the estimation results for Japan and Canada do not support this proposition. The response of private savings to debt financed expenditure changes, (contrary to tax changes) is small, except for Japan and US.

The results of the ECM show, that the coefficient on net lending was negative and statistically significant for every country, the social security surplus was in four out of five cases not significant. The private saving offset to government investment was estimated to be larger than to other expenditures in two cases.

Those result suggest a private saving offset to government budget deficits both in the short and in the long run, providing support for a weak Ricardian equivalence theorem.

**Table 1. The estimated interaction between private saving rate and fiscal policy in selected developed countries**

	United States		Japan		Germany		United Kingdom		Canada	
	long - run eq.	ECM								
constant	0.88	0.00	0.19	0.00	0.45	0.00	0.17	0.00	0.63	0.01
trend	0.002		0.002		0.001		0.000		0.008	
% of elderly	-3.11	-2.76	2.99	1.89	0.59	0.86	0.21	-0.41	-2.87	-2.34
income growth	0.04	0.06	-0.05	-0.05	0.15	0.19	0.21	0.15	0.02	0.06
net lending of government (nl)	-1.08	-0.97	-1.37	-0.79	-1.18	-1.17	-0.54	-0.49	-0.84	-0.73
social security	0.23	0.22	2.86	0.06	-0.18	-0.58	-2.14	-1.72	-0.85	-0.20
government consumption (ge)	-1.03	-0.83	-2.03	-1.67	-1.42	-1.31	-0.39	-0.48	-0.76	-0.52
government investment (gni)	-1.94	-2.27	-1.18	-0.58	-1.48	-1.02	-0.91	-1.13	-0.63	0.56
ge-nl	0.05	0.14	-0.66	-0.86	-0.24	-0.14	0.15	0.01	0.08	0.21
gni-nl	-0.86	-1.30	0.19	0.21	-0.30	0.15	-0.37	-0.64	0.21	1.29

Source: M. Hutchison (1992), p.29–30 in ECM all variables are in first - difference form

The response to expenditure induced rise in the budget deficit, in contrast to a tax-induced change, is mostly very small.

## **2.4. Empirical Results for Transition Economies**

### **2.4.1. Panel Estimation for 7 Transition Economies**

The question of the degree of influence of the government budget on the private saving ratio is crucial for the transition economies. Unfortunately it seems, that it is almost impossible to answer this question. The main reason is the lack of reliable and comparable data.

As it was stated earlier, most economists postulate, that it is impossible to determine the existence and degree of private savings offset to changes in budget deficit on purely theoretical grounds. To solve this problem comprehensive empirical research is needed, which results depend crucially on good quality data and long time-series. Those conditions are for obvious reasons not met in the case of transition countries.

If one however tries to theoretically speculate, whether the Ricardian Equivalence might work in the Central European countries, the more plausible answer seems to be negative. The assumptions underlying the Theorem are probably not met in transition economies.

The market economy is still young: many people have liquidity constraints, because of the underdevelopment of financial markets and high borrowing costs. Many people are myopic, as they are not used to the market rules and do not see the connection between present debt and future taxes, people are uncertain of the future and of the durability of the government and of the whole system, etc.

Empirical research, done rather just for the fun of it, that for any solid results, suggest, that the above conclusions may be right. I developed a model, based on the model by Hutchinson, in which the private saving rate was regressed on the government budget deficits, government expenditures (all measured as ratios of nominal GDP), growth rates of real output, and dependency ratio (measured as the percentage of people under 14 and over 65 in the total population).

The sample is 7 transition countries – Poland, Hungary, Czech Republic, Slovak Republic, Lithuania, Latvia and Estonia. The data is obtained from World Bank and IMF International Financial Statistics and International Government Statistics: the data on

national saving rate, dependency ratio is from World Bank, the data on government statistics and on the real growth rates are from IMF. The exception is Poland and Hungary, where sufficient government statistics from IMF was unavailable, and national statistics on government accounts were used. The time span is 1991–1996 for Poland and Hungary, 1993–1996 for Czech Republic, Slovak Republic and Lithuania, 1994–1996 for Latvia and 1995–1996 for Estonia. Because the time series data is so short and the data for the government budget deficit and expenditures for Poland and Hungary is not comparable to the IMF data for other countries, the model does not pretend to deliver definite answers on the determinants of the private saving rate in the transition countries. It is done rather as an exercise that can give some very weak hints as to whether the level of budget deficit has an impact on the level of private savings.

In Table 2 and 3 I report the results from estimating the Fixed and Random Effects Models. The software that I used was TSP. The variables are:

PRIVSAV – private saving rate,

DEF – consolidated central government budget deficit/GDP,

INC – real income growth rate,

DEP – dependency ratio,

EXP – consolidated central government expenditure/GDP,

Unbalanced data: Number of Individuals 7, TMIN= 2. TMAX= 6,

No of observations 29.

**Table 2. WITHIN (fixed effects) Estimates. The dependent variable: private saving rate**

<b>Variable</b>	<b>Coefficient</b>	<b>Error</b>	<b>t-statistic</b>
DEF	-.089506	.402870	-.222172
INC	-.052422	.089605	-.585032
DEP	.208797	.094798	2.20254
EXP	-1.11132	.391164	-2.84104
R-squared = .705211			
Adjusted R-squared = .541440			
F test of A,B=Ai,B: F(6,18) = 6.4520, P-value = [.0009]			
Critical F value for diffuse prior (Leamer, p.114) = 3.0212			

In both models the government budget was insignificant, indicating, that using the available data, it is impossible to empirically conclude, that the level of budget deficit does have an impact on the level of private savings. The government expenditure is negative and statistically significant, indicating, that an increase in government expenditures, with net lending held constant (i.e. tax financed) lowers private savings. This suggests, that the

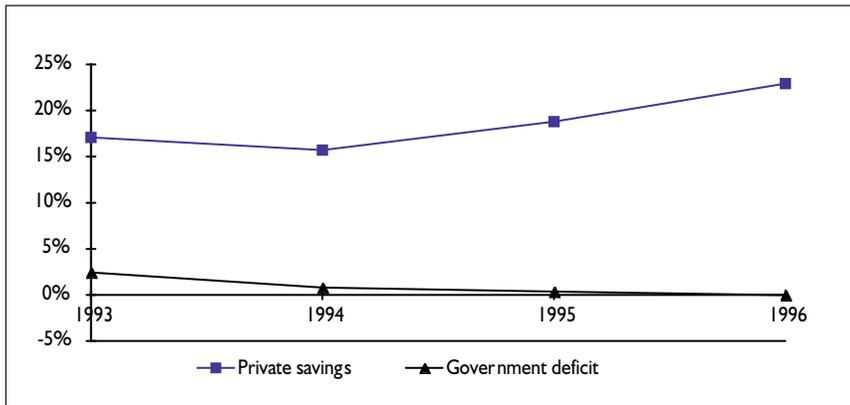
government consumption is not perceived by the public as a close substitute for private consumption.

**Table 3. WITHIN (fixed effects) Estimates. The dependent variable: private saving rate**

Variable	Coefficient	Error	t-statistic
DEF	.262887	.345732	.760378
INC	.014957	.085147	.175664
DEP	.117487	.080796	1.45411
EXP	-.393776	.303666	-1.29674
C	.272213	.106626	2.55297
R-squared = .508271			
Adjusted R-squared = .235089			
Hausman test of H0:RE vs. FE: CHISQ(4) = 10.325, P-value = [.0353]			
VWITH (variance of U <sub>it</sub> ) = 0.12951E-02			
VBET (variance of A <sub>i</sub> ) = 0.17652E-02			
(computed from small sample formula)			
THETA (0=WITHIN, 1=TOTAL) = 0.10896			
(evaluated at TMAX = 6)			

Charts 1, 2, 3 and 4 reveal additional information for Czech Republic, Estonia, Hungary and Slovenia.

**Chart 1. The private saving ratio and consolidated central government budget deficit in the Czech Republic, in per cent of GDP**

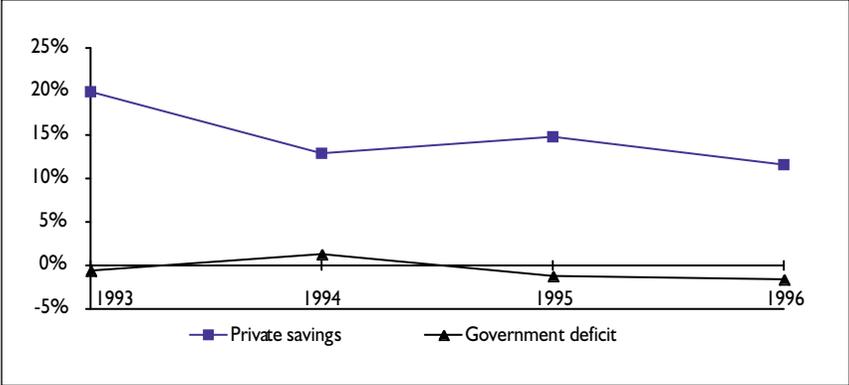


Source: World Bank database (1998) and IMF Government Statistics Yearbook (1997)

In the case of the Czech Republic, the development in the series might suggest some form of Ricardian behaviour: since 1994 the government budget surplus decreased, and

in the same time the private saving ratio grew, more than offsetting the fall in government savings.

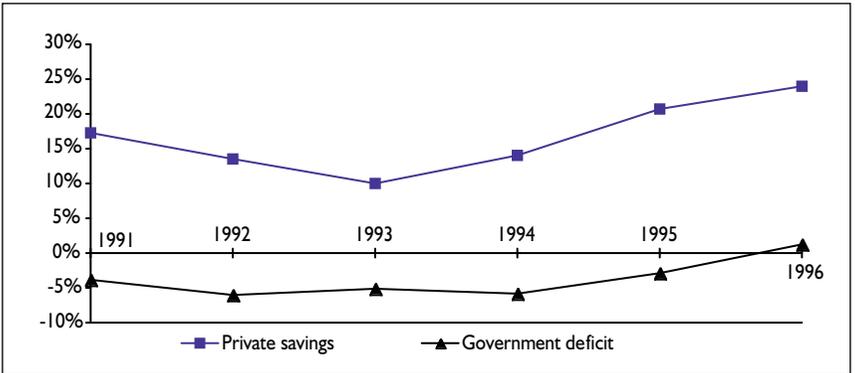
**Chart 2. The private saving ratio and general government budget deficit in Estonia, in per cent of GDP**



Source: World Bank database (1998) and IMF Staff Country Report: Estonia (1998)

In Estonia, the development of private savings and government deficit might suggest a form of Ricardian Equivalence, especially during 1993–1995, when private saving rate was moving in opposite direction to the developments in government balance. During 1993, as the budget deficit turned into surplus, private savings decreased, and in the following year, as the budget deteriorated, private savings rose.

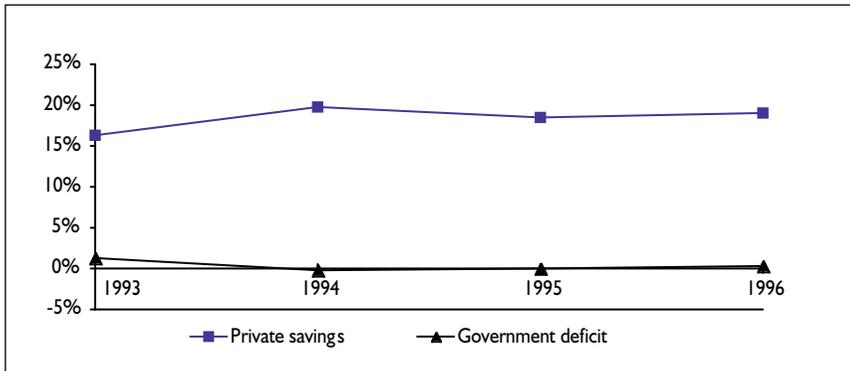
**Chart 3. The private saving ratio and general government budget deficit in Hungary, in per cent of GDP**



Source: World Bank database (1998) and Statistical Yearbook of Hungary (1997)

It seems, that in Hungary there indeed is no Ricardian-type interaction between the government budget deficit and private savings, as the private saving ratio changes rather in line, than opposite to the changes in budget deficits. This might suggest a classical case, where an increase in budget deficit causes private savings to fall.

**Chart 4. The private saving ratio and general government budget deficit in Slovenia, in per cent of GDP**



Source: World Bank database (1998) and IMF, Republic of Slovenia: Recent Economic Developments (1998)

In the case of Slovenia, both the government budget deficit and private saving rate have been stable, not allowing for any conclusions on the impact of public sector deficit on private saving rate.

### **2.4.2. The Case of Poland**

A brief examination of data on private saving rate and government net lending in Poland for years 1991–1997 suggests, that there does not exist a strong Ricardian-type relationship between private saving rate and net lending of the general government. Up to 1993, as the government net lending was decreasing, private saving rate has been falling, what is consistent with the Barro-Ricardo Theorem. In year 1994 the saving rate jumped by up almost 4 percentage points and the government deficit turned into large surplus. Year 1994 is however an outlier: because of the external public debt reduction, which was an effect of the agreement with Paris and London Club, the government sector displayed large net borrowing. Another aspect, that is blurring the analysis is, that the data for 1994–1997 includes estimates of hidden economy, therefore it is not fully

comparable with 1991–1993 data [4]. Therefore year 1994 should be treated differently, and any comparison of data on private saving before and after 1994 should be done with caution. In year 1995 the saving rate grew by 1 percentage point, up to 20% of GDP and the government budget improved, compared to 1993. In 1996–1997 the general government budget outcome stabilised at –2.9%, –3% of GDP, but of GDP and 19% of GDP, but private saving ratio has been slowly declining.

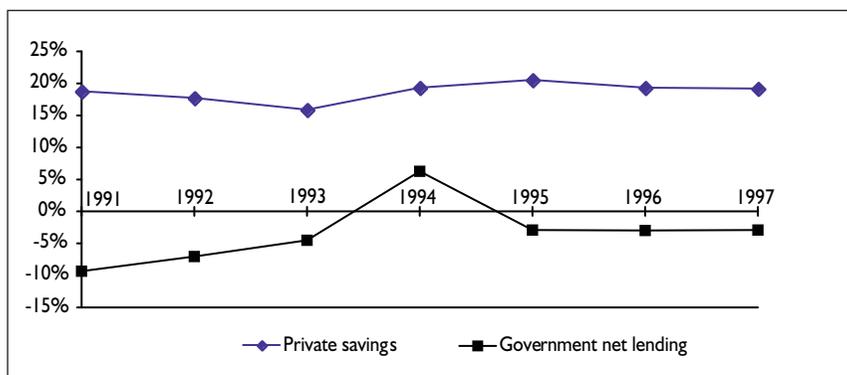
The Polish private saving rate and general government net lending are presented in Table 4 and Charts 5, 6, and 7.

**Table 4. Private saving rate and general government net lending in Poland, in per cent of GDP**

	Private saving rate	General government net lending
1991	18.77%	-9.35%
1992	17.74%	-7.05%
1993	15.91%	-4.51%
1994	19.34%	6.25%
1995	20.55%	-2.89%
1996	19.32%	-2.99%
1997	19.19%	-2.91%

Source: National Accounts, 1991–1997, Polish Central Statistical Office, 1999

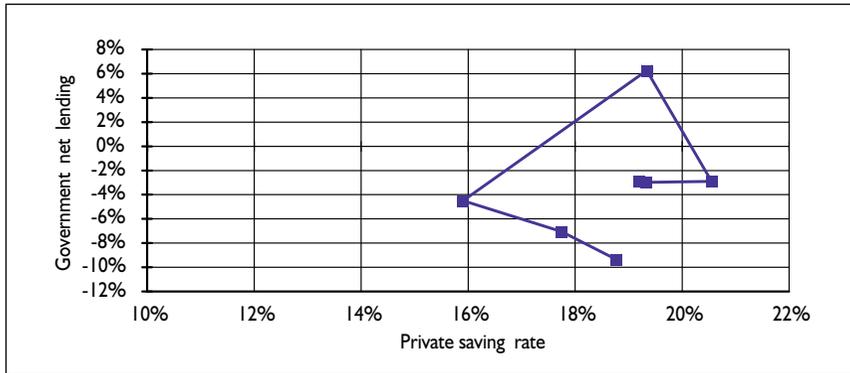
**Chart 5. The government net lending and private saving rate in Poland, in percent of GDP, 1991–1997**



Source: National Accounts, 1991–1997, Polish Central Statistical Office, 1999

[4] The private saving rate in 1994 reported by previous issues of National Accounts, without the estimates of hidden economy was 16.8% PKB.

**Chart 6. Scatter plot of private saving rate and government net lending, in percent of GDP**



Source: National Accounts, 1991–1997, Polish Central Statistical Office, 1999

The correlation coefficient between the general government net lending and private savings is low and positive: 0.3174, indicating, that there does not exist a linear, Ricardian-type relationship between both series. Excluding year 1994 does not lead to different conclusions: the correlation is again positive: 0.303

The low positive correlation coefficient, as well as examination of scatter plot (Chart 6) suggest, that Ricardian Equivalence Theorem is not relevant for the Polish economy i.e. that the changes in government (dis)savings will probably not be offset by changes in private savings.

However, it must be emphasised, that a much longer time period is needed to prove or deny an existence of any relationship.

The theoretical as well as empirical researches done by Hutchinson (1992) and by Masson et.al. (1995) indicate, that expenditure and tax policies should have different effects on private savings, in particular, a tax-induced decline in government budget deficit should have a bigger effect on private saving rate, than the lowering of budget deficit caused by expenditure cuts. Additionally, the social security balance is estimated to have a very small effect on private savings.

Therefore, to further investigate the possible private – public savings relationship in Poland, a more detailed analysis of the fiscal adjustment is needed.

The relevant data is presented in Table 6.

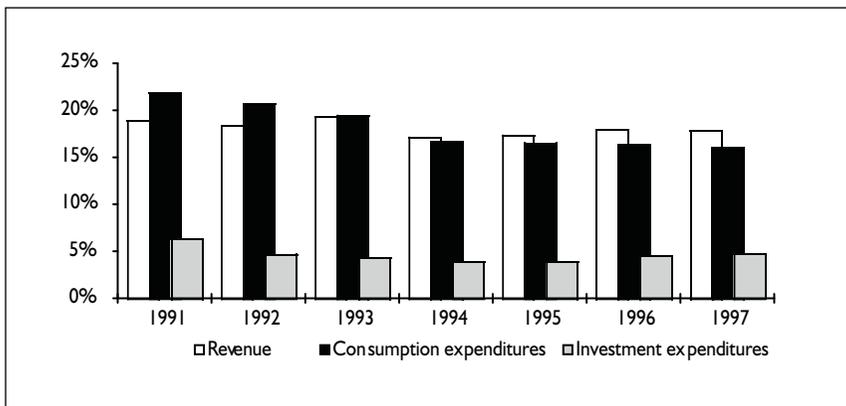
**Table 6. General government of Poland, data in per cent of GDP**

	<b>General government revenues*</b>	<b>General government consumption expenditures</b>	<b>General government investments</b>	<b>General government savings</b>	<b>General government net lending</b>	<b>Social security balance</b>	<b>Net lending - Social security</b>
1991	18.96%	21.87%	6.44%	-2.91%	-9.35%	-4.75%	-4.60%
1992	18.42%	20.72%	4.75%	-2.30%	-7.05%	-5.18%	-1.87%
1993	19.38%	19.52%	4.36%	-0.14%	-4.51%	-5.55%	1.04%
1994	17.21%	16.74%	3.92%	0.46%	-3.46%	-6.12%	2.66%
1995	17.40%	16.58%	3.93%	0.82%	-2.89%	-3.23%	0.34%
1996	18.00%	16.46%	4.60%	1.55%	-2.99%	-2.56%	-0.42%
1997	17.94%	16.12%	4.77%	1.81%	-2.91%	-2.55%	-0.35%

Source: National Accounts, 1991–1997, Polish Central Statistical Office, 1999

\*revenues are net of transfers

**Chart 7. General government revenue and expenditure in Poland, in percent of GDP, 1991–1997**



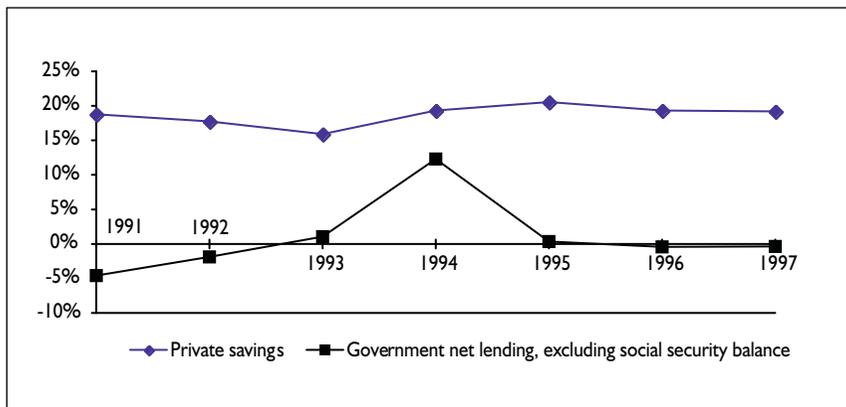
Source: National Accounts, 1991–1997, Polish Central Statistical Office, 1999

The decline of government net lending during 1991–1997 was caused mainly by a reduction in consumption spending: net lending of general government decreased by 6.44 percentage points, from over –9% of GDP in 1991 to less than –3% of GDP in 1997. Total expenditures were lowered by 7.42 percentage points; in particular consumption spending was lowered by 5.75 percentage points and investment spending by 1.67 percentage points. The government revenues declined by 1.02 percentage points.

The social security deficit is responsible for a significant amount of net lending; since year 1993 government net lending, excluding social security, was positive or close to null. If the social security balance is excluded from government net lending, as proposed by Hutchinson (1992), the correlation between the government net lending without social security balance is still positive: 0.1413. If however year 1994 is excluded the correlation becomes negative, but still very low: –0.12. This is consistent with Ricardian proposition, although the correlation is very low, which makes the existence of Ricardian Equivalence in Poland very questionable. The appearance of negative correlation (and therefore the appearance of possible Ricardian behaviour) is consistent with the proposition [Hutchinson, 1992], that changes in social security balance operating on pay-as-you-go transfer can in practise cause differential response as opposed to other budget factors. The Ricardian behaviour will more likely be observed, when one investigates the relationship between private savings and government budget balance without social security.

Both series are depicted in Chart 8.

**Chart 8. General government net lending, excluding social security balance and private saving rate in Poland, in percent of GDP**



Source: National Accounts, 1991–1997, Polish Central Statistical Office, 1999

The above analysis of the Polish data allows to draw some conclusion. Of course, these conclusions are not very strong, due to the short time span available for investigation

Available data suggest, that for the Polish economy the propositions of Ricardian Equivalence Theorem are not relevant with respect to the whole general government sector.

However, one cannot rule out a possibility, that there exists some very weak form of Ricardian Equivalence in Poland, however only when the relevant series is government net lending without social security balance. If one excludes the social security balance form the government net lending, than the correlation between private saving and government budget outcome becomes negative, what is consistent with the Ricardian proposition.

The correlation is very low, but this can be justified by the fact, that in Poland the fiscal adjustment had the form of expenditure cuts. According to Hutchinson (1992) a change in fiscal position in form of tax increase rather than expenditure cut, is likely to induce more of a private saving offset than the consolidation done so far.

Therefore, there might exist a weak form of Ricardian relationship in Poland between private saving rate and general government net lending, but without the social security. If this is true, then a change in government savings (without social security) might induce an offsetting change in private savings, but this change will be less than proportionate.

However, it must be emphasised, that is only a speculation. Saving behaviour is a very complex phenomenon and much longer time series is needed to draw any definite

conclusions. Besides, the data is not fully comparable, what makes the speculations even more questionable.

## **2.5. Conclusions**

This paper has investigated the theoretical as well as empirical literature on the impact of fiscal policy on private saving rate and tried to draw some conclusions for the transition economies, with a special attention on Poland.

The survey of the literature indicates, that a definite answer to the question on the existence and strength of such an impact does not exist.

The main views – the Ricardian-Barro Equivalence Theorem and Neo-classical view – give contradicting results. The first one predicts, that the private saving rate will offset the tax-induced changes in government budget outcome, so that the national savings will not change as a result of a change in government savings. The second one holds, that private savings will not offset increase in budget deficit and therefore national savings will decline.

The empirical research is also not uniform. However, the recent research, that I have come across indicates, that, to some extent, private saving offsets the changes in government savings, but a pure Ricardian equivalence hypothesis is rejected.

In addition, it seems, that different fiscal policy tools will have different implications for private saving. The results are again not uniform, but some of the research suggests that private savings offsets the tax induced fluctuations in government net lending to a much greater extent than the changes induced by spending policies.

It also seems, that the strength of private saving offset is country specific and is influenced by the institutional environment in a surveyed country.

The question of the interactions between public and private savings is important for the transition economies. Unfortunately, the short time span and the poor quality of the data make it virtually impossible to determine this issue at present point in time. The panel analysis done for 7 transition economies indicates, that the budget outcome does not influence the private saving rate. A simple analysis for Poland also indicates, that in years 1991–1997 there was no strong Ricardian-type relationship between the government net lending and private savings. There is however a possibility of the existence of a weak form of Ricardian Equivalence in Poland, when one assumes, that the social security is treated differently than the rest of government net lending, and therefore social security balance is excluded from government budget balance. However, much longer time series is needed to draw any strong conclusions.

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## **Part 3. Influence of Interest Rates on Credits and Deposits of Non-Financial Sector in Poland**

**Paweł Kaczorowski, Tomasz Tokarski**

### **3.1. Introduction**

The purpose of this paper is to analyse the effects of real interest rates on the magnitude of credits and deposits held by households and non-financial sector enterprises in Poland during the period 1994–1998. Other exogenous variables explaining behaviour of credits and deposits include such macroeconomic variables as: real GDP, monetary aggregate  $M_2$  to monetary base ratio (approximating the development of banking sector in Poland), real exchange rate of USD to PLN (defined as a relation of nominal exchange rate to CPI or PPI) and real interest rates on currency deposits.

The paper is divided into four sections. The dynamics of real interest rates, as well as dynamics of deposits and credits, during the 1993–1998 period is analysed first. The results of statistical analyses of macroeconomic variables' influence on deposits of households and enterprises are shown in the next section. The following section examines determinants of credits, and the last section contains conclusions.

### **3.2. Deposits, Credits and Interest Rates**

This paper tries to determine factors that affect the amount of deposits and credits held by agents of non-financial sector in Polish economy. The research focuses on households and enterprises during the 1993–1997 period. The source of data used in analyses are monthly Information Bulletins of National Bank of Poland (NBP).

Household deposits (DG) amounted to over 70% of total deposits of non-financial sector agents (both in zlotys and foreign currency) during the analysed period. The share of enterprises deposits (DP) shows a noticeable trend to decrease and there is an increase of absolute value of household deposits (see: Figure 1). The amount of deposits of economic agents tends to be seasonal: there is a decline in enterprise deposits in the first quarter and increases in following quarters. A rise of household deposits is observed together with a decrease in enterprise deposits at the beginning of the year. That phenomenon may be a result of dividing gains accumulated by enterprises during previous year.

### **3.2.1. Deposits of Households and Enterprises**

Real [1] total household deposits (sum of deposits in domestic and foreign currency) were increasing by approximately 2–6% a quarter. Substantial changes are observed among different kinds of deposits (see: Figure 2). The share of foreign currency deposits in total deposits during the years 1993–1994 amounted to approximately 50%. Later this share started to decline sharply to reach 18.5% at the end of 1998.

Growth rate of total household deposits implies that the increase in growth rate of real zloty deposits is associated with a change in the deposits structure (foreign currency deposits were converted into zloty deposits). A comparison of the dynamics of real foreign currency deposits with zloty deposits of households confirms the hypothesis of substitution between these two kinds of deposits (see: Figure 3).

Enterprise deposits are characterised by a small share of foreign currency deposits (see: Figure 4). Till the end of 1995 this share was stable and did not exceed 6% of total enterprise deposits. This was due to restrictions concerning foreign currency accounts kept by enterprises. After these restrictions were abolished, at the beginning of 1996, the share of foreign currency deposits increased on average by 2.73 percentage points annually, to stabilise at the level of 13.4% of total enterprise deposits in 1998. There is a cyclical decline in the real value of zloty deposits in every first quarter.

### **3.2.2. Credits Granted to Households and Enterprises**

Practically, during the whole analysed period the real value of credits granted to households has shown a tendency to increase (see: Figure 5). It was the growth rate of credits that was significantly changing. After rapid increase in the years 1995–1997 the rate of growth decelerated to about 21% annually. It may be connected with the policy of curbing the increase of consumer credits' conducted by NBP. However, credits dynamics exceeded household deposits' dynamics (see: Figure 6).

The real value of credits given to enterprises decreased during the years 1993–1994. Only at the beginning of 1995 the amount of enterprise credits started to rise (see: Figure 7). Credits' dynamics exceeded dynamics of enterprise deposits in the middle of this year.

The growth rate of credits was (as in the case of households) restrained at the beginning of 1997.

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[1] Variables describing households and enterprises were deflated with CPI and PPI, respectively.

Table 1. Dynamics of real credits and real deposits of enterprises, 1994–1998

	1994	1995	1996	1997	1998
<b>Average annual dynamics of real enterprise credits</b>	0.972	1.022	1.148	1.227	1.173
<b>Average annual dynamics of real total enterprise deposits</b>	1.058	1.039	1.118	1.095	1.144

### 3.2.3. Interest Rates

Interest rate on zloty deposits ( $RZ$ ) was defined as an average rate on 6-month deposits in main commercial banks published by NBP. It was deflated according to a following formula:

$$r_t^z = \frac{1 + RDZ_t}{P_t / P_{t-4}}$$

where:

$r^z$  – real annual interest rate on zloty deposits,

$RDZ$  – nominal annual interest rate on zloty deposits,

$P_t/P_{t-4}$  – annual rate of inflation calculated with CPI for households and with PPI for enterprises.

Real interest rate is highly positively correlated with real deposit dynamics (see: Figure 8). Interest rate on foreign currency deposits was based an average rate on 6-month deposits in main commercial banks published by NBP. However, the amount of money (in zlotys) that agents may withdraw when the term deposit matures, depends on the exchange rate as well. Exchange rate was defined as an exchange rate of PLN/USD published by NBP. Actual nominal interest rate on deposits of domestic agents ( $R^{Fw}$ ) is a sum of interest rate on foreign currency deposits offered by banks ( $RDW$ ) and on growth rate of the exchange rate.

$$R_t^{Fw} = RDW_t + \left( \frac{USD_t - USD_{t-4}}{USD_{t-4}} \right)$$

where:

$R_t^{Fw}$  – actual nominal interest rate on foreign currency deposits in period  $t$ ,

$RDW_t$  – interest rate on foreign currency deposits offered by banks in period  $t$ ,

$USD_t$  – the amount of zlotys paid for USD in period  $t$ .

Real interest rate was calculated according to the formula:

$$r_t^w = \frac{I + R_t^{Fw}}{P_t / P_{t-4}}$$

where:

$r^w$  – real interest rate on foreign currency deposits,

other symbols as above.

When comparing the actual real foreign currency deposits interest rate with the growth of real foreign currency deposits one may observe a strong positive correlation between these two series (see Figure 9).

Lending rate (RKZ) was defined as an average interest rate on the-lowest-risk credits offered by main commercial banks. The rate is published by NBP. It was deflated in the same way as interest rate on zloty deposits. The volatility of lending rate is similar to that of zloty deposits, although interest rate on credits declines a bit faster. It means that spread diminished, i.e. the difference between interest rates on credits and deposits. It may be caused by an increasing competitiveness in the Polish banking sector.

### **3.2.4. Development of Banking System**

The development of banking sector is one of the factors that influence the amounts of credits and deposits in the economy. The degree of development was approximated by a ratio of monetary aggregate  $M_2$  to monetary base (money multiplier). The higher the multiplier, the more developed the banking sector is. The rate of money flowing out of the banking sector negatively influences the multiplier (with reserve requirements independent of commercial banks). It means that activities of banks on making their offer more attractive (for example by introducing credit and debit cards, opening new offices, and simplifying banking procedures) should lead to a smaller outflow of money from the banking system and to a bigger multiplier.

## **3.3. Deposits and Interest Rates**

To analyse the influence of real interest rates on deposits held by households and enterprises authors use a simple microeconomic model of intertemporal choice. Following assumptions are made:

1. A typical economic agent has the following utility function:

$$u(c_0, c_1) = c_0^\theta c_1^{1-\theta} \quad \theta \in (0;1) \quad (1)$$

where  $c_0$  ( $c_1$ ) is current consumption (expected future consumption) and  $\theta$  ( $1-\theta$ ) stands for elasticity of utility with respect to current consumption (expected future consumption).

2. A typical agent earns real current income  $y_0 > 0$ . He may use it either for current consumption  $c_0$  or for current saving  $s$ . It means that:

$$y_0 = c_0 + s \quad (2)$$

3. Future consumption  $c_1$  is paid for with future income  $y_1 > 0$  and savings  $s$  (taking into consideration discount rate – real interest rate  $r$ ):

$$c_1 = y_1 + (1+r)s \quad (3)$$

Combining equations (2–3) gives intertemporal budget constraint:

$$(1+r)c_0 + c_1 - (1+r)y_0 - y_1 = 0 \quad (4)$$

Finding an optimal consumption structure ( $c_0; c_1$ ) and an amount of current saving is synonymous with the maximization of the utility function (1) with budget constraint (4).

J.L. Lagrange polynomial for this problem is given by a formula:

$$L(c_0, c_1, \lambda) = c_0^\theta c_1^{1-\theta} + \lambda[(1+r)c_0 + c_1 - (1+r)y_0 - y_1]$$

where  $\lambda \in \mathcal{R}$  is indefinite Lagrange multiplier.

Maximum of function (1) with budget constraint (4) exists only if following necessary conditions are satisfied:

$$\left. \begin{aligned} \frac{\partial L}{\partial c_0} &= \theta c_0^{\theta-1} c_1^{1-\theta} + \lambda(1+r) = 0 \\ \frac{\partial L}{\partial c_1} &= (1-\theta)c_0^\theta c_1^{-\theta} + \lambda = 0 \\ \frac{\partial L}{\partial \lambda} &= (1+r)c_0 + c_1 - (1+r)y_0 - y_1 = 0 \end{aligned} \right\} \quad (5)$$

It may be proved that optimal consumption structure (satisfying necessary conditions for the existence of mentioned above Lagrange's conditional extreme) is given by a formula:

$$\left. \begin{aligned} c_0 &= \theta \left( y_0 + \frac{y_1}{1+r} \right) \\ c_1 &= (1-\theta) [(1+r)y_0 + y_1] \end{aligned} \right\} \quad (6)$$

A current saving function of typical agent can be obtained from the first simultaneous equation (6) and equation (2):

$$s = (1 - \theta)y_0 - \theta \frac{y_1}{1+r} \quad (7)$$

Basing on equation (7) one can conclude that there exist following relations [2]:

$$s = s \left( y_0^+, r^+, \theta^-, y_1^- \right)$$

It means that the higher real current income and real interest rate, the higher should be current saving. The higher the elasticity of utility with respect to current consumption and expected future income, the lower is current saving.  $\theta$  and  $y_1$  cannot be measured directly, therefore authors concentrate mainly on the effect  $y_0$  and  $r$  on  $s$ .

It should be mentioned that deposits of households were divided into foreign currency and zloty denominated deposits (changes in structure of these deposits are presented in the second section of this paper). It was assumed that the first difference of the logarithm of real zloty deposits (deflated with CPI) is a function of the logarithm of real interest rate (deflated with CPI) on these deposits, real exchange rate (defined as a ratio of the amount of zlotys paid for USD to CPI), real GDP (as a proxy for personal incomes),  $M_2$  to monetary base H ratio (measuring the degree of Polish banking sector development) and logarithm of real zloty deposits in previous period. In order to avoid seasonality (resulting from seasonality of GDP) seasonal differencing (4-differencing) was used.

The equation describing first differences of deposits may be written in the following form:

$$\begin{aligned} \Delta_4 \ln \left( \frac{DZG_t}{CPI_t} \right) &= \alpha_0 + \alpha_1 \ln \left( \frac{1 + RDZ_t}{CPI_t / CPI_{t-4}} \right) - \alpha_2 \ln \left( \frac{USD_t}{CPI_t} \right) + \alpha_3 \ln(PKB_t) + \\ &+ \alpha_4 \ln \left( \frac{M2_t}{H_t} \right) - \alpha_5 \ln \left( \frac{DZG_{t-4}}{CPI_{t-4}} \right) + \xi_t^{DZG} \quad \alpha_0 \in \mathfrak{R}; \quad \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5 > 0 \end{aligned} \quad (8)$$

where:

$$\Delta_4 \ln \left( \frac{DZG_t}{CPI_t} \right) \equiv \ln \left( \frac{DZG_t}{CPI_t} \right) - \ln \left( \frac{DZG_{t-4}}{CPI_{t-4}} \right)$$

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[2] Formula of  $y = y \left( x_1^+, x_2^-, \dots \right)$  means that  $y$  is an increasing (decreasing) function of variable  $x_1$  ( $x_2$ ).

$DZG_t$  – nominal zloty deposits held by households (in million of zlotys) in period  $t$ ; source as in the second section,

$CPI_t$  – CPI in period  $t$  (1995:1 equals 1); source as in the second section,

$RDZ_t$  – nominal interest rate on zloty deposits offered by main commercial banks in period  $t$ ; source as in the second section,

$USD_t$  – the amount of zlotys paid for USD in period  $t$ ; source as in the second section,

$PKB_t$  – real GDP in period  $t$  (1995:1 prices) [3],

$M2_t$  – monetary aggregate  $M2$  in period  $t$ ; source as in the second section,

$H_t$  – monetary base in period  $t$ ; source as in the second section,

$\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4$  and  $\alpha_5$  – structural parameters of equation (8),

$\xi_t DZG$  – random error term.

$\Delta_4 \ln \left( \frac{DZG_t}{CPI_t} \right)$  in equation (9) is an approximation of current savings  $s$  in equation (7).

$\frac{1 + RDZ_t}{CPI_t / CPI_{t-4}}$  and  $PKB_t$  stand for  $r$  and  $y_0$ , respectively. Negative influence of real exchange rate  $USD_t/CPI_t$  on  $\Delta_4 \ln \left( \frac{DZG_t}{CPI_t} \right)$  may result from the policy of real appreciation of zloty, when economic agents convert their foreign currency deposits into zloty deposits. Therefore, the lower the  $USD_t$  to  $CPI_t$  ratio, the higher the growth rate of zloty deposits and the higher  $\Delta_4 \ln \left( \frac{DZG_t}{CPI_t} \right)$  will be. Ratio of  $M2_t$  to  $H_t$  describes the effect of development of banking sector on the amount of zloty denominated deposits. The effect of  $\ln \left( \frac{DZG_{t-4}}{CPI_{t-4}} \right)$  on  $\Delta_4 \ln \left( \frac{DZG_t}{CPI_t} \right)$  may come as a result of the assumption that the higher the level of deposits, the lower the first difference of this variable (it is therefore assumed that growth rates of household zloty deposits decline if levels of these deposits rise).

To analyse the structure of household deposits (defined as a ratio of foreign currency deposits to total deposits), authors estimated the following regression:

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[3] Source: J. Brzezczczyński, R. Kelm, A. Welfe, "Banki danych wysokiej częstotliwości modeli serii WK", Prace Instytutu Ekonometrii i Statystyki UŁ, Łódź, 1996 and Statistical Bulletin published by Central Statistical Office (GUS).

$$\ln\left(\frac{DWG_t}{DWG_t + DZG_t}\right) = \beta_0 - \beta_1 \ln\left(\frac{1 + RDZ_t}{CPI_t / CPI_{t-4}}\right) + \beta_2 \ln\left(\frac{RDZ_t + USD_t / USD_{t-4}}{CPI_t / CPI_{t-4}}\right) + \beta_3 \ln\left(\frac{M2_t}{H_t}\right) + \beta_4 d_{95} + \xi_t^S \quad \beta_0 \in \mathfrak{R}; \beta_1, \beta_2, \beta_3, \beta_4 > 0 \quad (9)$$

where:

$$\frac{DWG_t}{DWG_t + DZG_t}$$

is a share of foreign currency deposits held by households in total household deposits; source as in the second section,

$$\frac{1 + RDZ_t}{CPI_t / CPI_{t-4}}$$

is real interest rate on zloty deposits in main commercial banks; source as in the second section,

$$\frac{RDZ_t + USD_t / USD_{t-4}}{CPI_t / CPI_{t-4}}$$

is real interest rate on foreign currency deposits; source as in the second section,

$d_{95}$  – dummy variable that equals 1 in 1995, and 0 otherwise,

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$  – structural parameters of equation (9),

$\xi_t^S$  – random error term.

Specification of equation (9) implies that authors make following assumptions:

– The higher real interest rate on foreign currency (zloty) deposits, the lower (higher) the share of foreign currency deposits of households in total household deposits. Zloty appreciated in real terms and real interest rate on foreign currency deposits was most of the time lower than on zloty deposits. As a result, households converted their foreign currency savings into zloty savings. The higher the real interest rate on zloty deposits to foreign currency deposits, the higher was the confidence in domestic currency and the lower share of foreign currency deposit.

–  $M2/H$  variable describes development of Polish banking sector. Its influence on the share of foreign currency deposits in total household deposits may be explained in a following way: it is possible that at the beginning of the transition period a big part of savings was kept in US dollars outside the banking system because agents did not trust in domestic currency and because the banking system was underdeveloped. As the banking system developed, households were more and more eager to keep their savings in banks. Part of dollar savings was placed on banking accounts. Savings in foreign currencies were converted into Polish zloty and put in banks as zloty deposits because real interest rate on zloty deposits were higher than on foreign currency deposits. Provided that the above

arguments are valid and relations between the above-mentioned variables are correctly specified, the higher the  $M_2$  to  $H$  ratio, the lower should be the share of foreign currency deposits in total household deposits.

– Dummy variable  $d_{95}$  describes the results of liberalising the exchange rate (with respect to convertible currencies) on the structure of households deposits in 1995.

Equations (8–9) were estimated using Two-Stage Least Squares method (TSLS). TSLS estimations of the above mentioned equations during the years 1994–1998 yielded following results [4]:

$$\Delta_4 \ln \left( \frac{DZG_t}{CPI_t} \right) = 4.841 + 4.108 \ln \left( \frac{1 + RDZ_t}{CPI_t / CPI_{t-4}} \right) - 1.003 \ln \left( \frac{USD_t}{CPI_t} \right) +$$

$$+ 0.182 \ln(PKB_t) + 0.890 \ln \left( \frac{M_2_t}{H_t} \right) - 0.681 \ln \left( \frac{DZG_{t-4}}{CPI_{t-4}} \right)$$

(2.204) (1.864) (-5.044)

$$R^2 = 0.963 \quad \text{adj. } R^2 = 0.950 \quad DW = 1.700$$

$$\ln \left( \frac{DWG_t}{DWG_t + DZG_t} \right) = 2.870 - 4.945 \ln \left( \frac{1 + RDZ_t}{CPI_t / CPI_{t-4}} \right) +$$

$$+ 0.546 \ln \left( \frac{RDZ_t + USD_t / USD_{t-4}}{CPI_t / CPI_{t-4}} \right) + -3.088 \ln \left( \frac{M_2_t}{H_t} \right) + 0.119 d_{95}$$

(5.757) (-5.825) (1.862) (-8.020) (2.217)

$$R^2 = 0.968 \quad \text{adj. } R^2 = 0.956 \quad DW = 1.909$$

One can draw following statistical conclusions from presented estimations of functions (8–9):

– Right hand side variables specified in equations (8–9) explain approximately 95% and 96% of variation in endogenous variables (see adjusted  $R^2$ ).

– All explanatory variables significantly influenced endogenous variables at 8% significance level.

– An increase of real interest rate on zloty deposits by 1% raised the growth rate of these deposits by approximately 4.1% [5]. The same increase in real exchange rate of USD led to about 1% decline in the growth rate. One percent rise of real GDP raised the growth rate of zloty denominated deposits of households by 0.18%. Moreover, every

[4] Values of t statistics are given in parenthesis below the estimated coefficients.  $R^2$  (adj.  $R^2$ ) stands for coefficient of determination (adjusted coefficient of determination), DW is J. Durbin-G.S. Watson statistic.

[5] All statistical conclusions are based on the *ceteris paribus* assumption.

increase in  $M_2/H$  ratio (describing the development of Polish banking sector) by 1% caused a 0.89% rise in the growth rate of deposits. If the level of these deposits increased by 1%, their growth rate would rise by approximately 0.69%.

– When analysing estimated parameters of the deposits structure equation one may state that: i) increase in real interest rate (deflated with CPI) on zloty deposits by 1% diminished the share of foreign currency deposits in total deposits by approximately 9.95%. ii) The same rise in real interest rate on USD deposits increased its share by about 0.55%. iii). Increase in  $M_2/H$  ratio by 1% led to approximately 3.09% decline in the share of USD deposits in total deposits. iv) the share of foreign currency deposits in total deposits in 1995 was by 0.12% higher than in any other period suggesting the existence of factors not specified in the model.

Deposits of enterprises were not disaggregated into zloty and foreign currency deposits because the share of foreign currency deposits in total deposits was very small relative to the share of zloty deposits in total household deposits. A following first difference equation of total enterprise deposits was estimated:

$$\begin{aligned} \Delta_4 \ln \left( \frac{DP_t}{PPI_t} \right) &= \gamma_0 + \gamma_1 \ln \left( \frac{1 + RDZ_t}{PPI_t / PPI_{t-4}} \right) - \gamma_2 \ln \left( \frac{USD_t}{PPI_t} \right) + \\ &+ \gamma_3 \ln(PKB_t) + \gamma_4 \ln \left( \frac{M2_t}{H_t} \right) - \gamma_5 \ln \left( \frac{DP_{t-4}}{PPI_{t-4}} \right) + \gamma_6 d_{98.4} + \xi_t^{DP} \\ \gamma_0, \gamma_6 &\in \mathfrak{R}; \quad \gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5 > 0 \quad (10) \end{aligned}$$

where:

$DP_t$  – nominal level of enterprises deposits in period  $t$ , in million PLN; source as in the second section,

$PPI_t$  –  $PPI$  in period  $t$  (1995:1 equals 1); source as in the second section,

$d_{98.4}$  – dummy variable that equals 1 in the fourth quarter of 1998, and 0 otherwise,

$RDZ_t, USD_t, PKB_t, M2_t, H_t$  – as in equation (8),

$\gamma_0, \gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5$  and  $\gamma_6$  – structural parameters of equation (10),

$\xi_t^{DP}$  – random error term.

The influence of real zloty deposits interest rate, real exchange rate, real GDP,  $M_2/H$  ratio and level of enterprise deposits (in real terms) on the growth rate of these deposits may be explained in the same way as the effect of analogous variables on the growth rate of household zloty deposits. Dummy variable  $d_{98.4}$  describes a rapid increase in growth rate of these deposits during the fourth quarter of 1998, caused by factors not specified in the model. OLS regression of equation (10) gave the following results:

$$\Delta_4 \ln \left( \frac{DP_t}{PPI_t} \right) = 2.418 + 1.337 \ln \left( \frac{I + RDZ_t}{PPI_t / PPI_{t-4}} \right) + 0.0722 \ln \left( \frac{USD_t}{PPI_t} \right) +$$

$$+ 0.205 \ln(PKB_t) + 0.134 \ln \left( \frac{M_2_t}{H_t} \right) - 0.493 \ln \left( \frac{DP_{t-4}}{PPI_{t-4}} \right) + 0.0867 d_{98.4}$$

$R^2 = 0.866 \quad adj. R^2 = 0.806 \quad DW = 2.342$

From the above estimations of equation 10 one may conclude that the influence of logarithms of real exchange rate and  $M_2/H$  ratio on the logarithm of real enterprise deposits growth rate is not significant (as may be seen from the low  $t$  statistics). Firstly, it may be caused by enterprises maintaining mainly zloty denominated deposits in Polish banks (because of institutional regulations) and therefore being indifferent to fluctuations of exchange rate. Secondly, there may be a history of keeping deposits in banks. This can explain the lack of influence of banking sector development (measured with  $M_2/H$  ratio) on the growth rate of enterprise deposits. This is why  $\ln(USD_t/PPI_t)$  and  $\ln(M_2_t/H_t)$  were removed from equation 10, which resulted in the following estimates:

$$\Delta_4 \ln \left( \frac{DP_t}{PPI_t} \right) = 2.260 + 1.376 \ln \left( \frac{I + RDZ_t}{PPI_t / PPI_{t-4}} \right) + 0.180 \ln(PKB_t) -$$

$$- 0.425 \ln \left( \frac{DP_{t-4}}{PPI_{t-4}} \right) + 0.0805 d_{98.4}$$

$R^2 = 0.864 \quad adj. R^2 = 0.827 \quad DW = 2.418$

From the above estimations of enterprise deposits growth rate one may conclude that:

- Independent variables specified in this equation explained approximately 83% of variation in the dependent variable.
- All exogenous variables significantly affected the endogenous variable.
- Increase in interest rate on zloty deposits by additional 1% led to about 1.38% rise of growth rate of enterprise deposits. The same change in real GDP increased analysed growth rate by approximately 0.18%, and 1% rise in the level of these deposits diminished their growth rate by about 0.43%. In the fourth quarter of 1998 growth rate of enterprise deposits was by 8% higher than in other periods.

Interest rate that determines total deposits of households and enterprises in the economy was defined as zloty deposit interest rate. This was done due to a big share of zloty deposits in total deposits (approximately 75%). Thus, the equation of total deposits is written in a following form:

$$\begin{aligned} \Delta_4 \ln \left( \frac{DOg_t}{Defl_t} \right) &= \tau_0 + \tau_1 \ln \left( \frac{1 + RDZ_t}{Defl_t / Defl_{t-4}} \right) + \tau_2 \ln PKB + \tau_3 \ln \left( \frac{M_2}{H} \right) - \\ &- \tau_4 \ln \left( \frac{USD}{Defl} \right) - \tau_5 \ln \left( \frac{DOg_{t-4}}{Defl_{t-4}} \right) + \tau_6 d_{97.3} + \xi_t^{Og} \\ \tau_0, \tau_6 &\in \mathfrak{R} \quad \tau_1, \tau_2, \tau_3, \tau_4, \tau_5 > 0 \end{aligned} \quad (11)$$

where:

$DOg_t$  – nominal level of total deposits of households and enterprises in period  $t$ , in million PLN,

$Defl_t$  – indicator of inflation rate in period  $t$ ; weighted average of CPI (83%) and PPI (17%) [6], 1995.1 equals 1,

$d_{97.3}$  – dummy variable that equals 1 in the third quarter of 1997, and 0 otherwise,

$\tau_0, \tau_1, \tau_2, \tau_3, \tau_4, \tau_5, \tau_6$  – structural parameters of equation (11),

$\xi_t^{Og}$  – random error term,

other symbols as above.

Following coefficients were obtained during the estimation:

$$\begin{aligned} \Delta_4 \ln \left( \frac{DOg_t}{Defl_t} \right) &= \underset{(3.626)}{1.962} + \underset{(7.651)}{1.526} \ln \left( \frac{1 + RDZ_t}{Defl_t / Defl_{t-4}} \right) + \underset{(2.106)}{0.061} \ln PKB + \\ &+ \underset{(1.714)}{0.190} \ln \left( \frac{M_2}{H} \right) - \underset{(-2.653)}{0.139} \ln \left( \frac{USD}{Defl} \right) - \underset{(-3.945)}{0.240} \ln \left( \frac{DOg_{t-4}}{Defl_{t-4}} \right) + \underset{(1.620)}{0.019} d_{97.3} \\ R^2 &= 0.973 \quad adj.R^2 = 0.960 \quad DW = 1.596 \end{aligned}$$

Independent variables used in the equation describe the behaviour of the dependent variable in 96%. All exogenous variables significantly influenced the left-hand side variable. Only the estimates of the degree of banking sector development and dummy variable  $t$  statistics were not conclusive. Obtained parameters should be understood in the following way: 1% increase in independent variables (other things being equal) raised the growth rate of total deposits by about 1.53% – in the case of interest rate on zloty deposits; by 0.06% – in the case of GDP growth; by approximately 0.19% – in the case of the growth of banking system development indicator. A 1% rise of real exchange rate and the level of total deposits diminished the growth rate of these deposits by about 0.14% and 0.24%, respectively. In

[6] Such weights were implied by IMF data: government and private consumption expenditures in Poland in the years 1990–1995 amounted to 83% of GDP.

addition, in the third quarter of 1997 the growth rate of analysed deposits was by approximately 2% higher than in other periods.

### 3.4. Determinants of Credits

Analysis of domestic currency credits given to households and enterprises has been already laid out in this paper. In both cases the first difference of the logarithm of credits was chosen as a dependent variable. It describes the actual behaviour of agents reacting to market situation. In other words, the volume of credits is less sensitive to economic conditions than its first difference.

Credits given to households were set to depend on the following factors:

- lending rate deflated with CPI. The working hypothesis was that the lending rate should negatively affect the first differences of households' indebtedness;
- GDP as an approximation of household incomes. Bigger incomes should encourage households to apply for credits [7];
- degree of banking sector development. The more developed the banking sector, the bigger should be availability of credits (for example through higher number of banking offices and intermediaries offering possibilities of buying on credit in shops, bigger competitiveness between banks and lower lending rates), and bigger credit availability should raise the amount of obtained credits.

Relations between real increase in the volume of credits and explanatory variables can be written in the following way:

$$\begin{aligned} \Delta_4 \ln \left( \frac{KG_t}{CPI_t} \right) &= \delta_0 + \delta_1 \ln PKB_t + \delta_2 \ln \left( \frac{M2_t}{H_t} \right) + \delta_3 \ln \frac{I + RKZ_t}{CPI_t / CPI_{t-4}} + \\ &+ \delta_4 d_{95} \ln \left( \frac{M2_t}{H_t} \right) + \delta_5 d_{97.3} - \delta_6 \ln \left( \frac{KG_{t-4}}{CPI_{t-4}} \right) + \xi_t^{KG} \\ \delta_0, \delta_4, \delta_5 &\in \mathfrak{R}; \quad \delta_1, \delta_2, \delta_3, \delta_6 > 0 \quad (12) \end{aligned}$$

where:

$KG_t$  – nominal level of credits given to households,

$d_{97.3}$ ,  $d_{95}$  – dummy variables for the third quarter of 1997 and for the whole year 1995, respectively,

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[7] It seems that the expected growth rate of GDP can serve as a better independent variable than GDP in levels. But the problem is that expected growth rate of GDP is difficult to measure, because it is difficult to assess whether expectations of economic agents are rather adaptive or rational.

$\delta_0, \delta_1, \dots, \delta_6$  – structural parameters of the equation (12),

$\xi_t^{KG}$  – random error term,

other symbols as above.

Estimated coefficients of equation (12) are presented below:

$$\begin{aligned} \Delta_t \ln \left( \frac{KG_t}{CPI_t} \right) = & -3.7443 + 0.3330 \ln(PKB_t) + 3.7161 \ln \left( \frac{M2_t}{H_t} \right) + \\ & + 1.3631 \ln \frac{1 + RKZ_t}{CPI_t / CPI_{t-4}} - 0.1664 d_{95} \ln \left( \frac{M2_t}{H_t} \right) + 0.2083 d_{97} d_3 + \\ & - 0.5394 \ln \left( \frac{KG_{t-4}}{CPI_{t-4}} \right) \\ R^2 = & 0.8359 \quad adj.R^2 = 0.7602 \quad DW = 2.4592 \end{aligned}$$

From the estimation of equation (12) one may conclude that:

- 76% of the dependent variable was explained by the right-hand side variables.
- Real GDP and real interest rate did not significantly (even at 10% significance level) influence the growth rate of real credits given to households.

– Increase in  $M_2/H$  ratio by 1% led to approximately 3.72% rise of the growth rate (excluding observations for 1995, when the elasticity of analysed growth rate with respect to  $M_2/H$  amounted to ca. 3.54%). During the third quarter of 1997 the credit growth rate rose by 0.21%. The rise might have been caused by floods in southern and western Poland in July. In spite of this, every additional 1% of credits obtained by households increased the growth rate by about 0.54%.

The growth of credits given to enterprises was affected by the following factors:

- Lending rate deflated with PPI. The interest rate should be negatively correlated with the dependent variable.
- Output (GDP).
- The growth rate of real exchange rate of USD. The inclusion of this variable was intended to pinpoint one of the factors determining foreign currency debt of enterprises. Higher and higher value of foreign currency should discourage enterprises from applying for foreign currency credits.
- Inflation rate. Growing uncertainty about economic situation and frequently changing cost of foreign capital should negatively influence readiness to get new credits and should encourage enterprises to use their own resources.

The growth of real domestic currency indebtedness of enterprises is given below:

$$\begin{aligned} \Delta_4 \ln \left( \frac{KP_t}{PPI_t} \right) &= \phi_0 + \phi_1 \ln(PKB_t) + \phi_2 \Delta_4 \ln \left( \frac{USD_t}{PPI_t} \right) - \phi_3 \ln \left( \frac{I + RKZ_t}{PPI_t / PPI_{t-4}} \right) + \\ &- \phi_4 \ln \left( \frac{PPI_t}{PPI_{t-4}} \right) + \phi_5 d_{95} \ln \left( \frac{I + RKZ_t}{PPI_t / PPI_{t-4}} \right) + \xi_t^{KP} \\ \phi_0, \phi_5 &\in \mathfrak{R}; \quad \phi_1, \phi_2, \phi_3, \phi_4 > 0 \quad (13) \end{aligned}$$

where:

$$\Delta_4 \ln \left( \frac{USD_t}{PPI_t} \right) \quad \text{acts as a logarithm of growth rate of real exchange rate,}$$

$\phi_0, \phi_1, \dots, \phi_5$  – structural parameters from the above described equation,

$\xi_t^{KP}$  – random error term,

other symbols as above.

Estimation yielded following coefficients of function (13):

$$\begin{aligned} \Delta_4 \ln \left( \frac{KP_t}{PPI_t} \right) &= \underset{(1.3491)}{0.8512} - \underset{(-0.6773)}{0.0384} \ln(PKB_t) + \underset{(5.2525)}{0.4657} \Delta_4 \ln \left( \frac{USD_t}{PPI_t} \right) + \\ &- \underset{(-3.0745)}{1.0941} \ln \left( \frac{I + RKZ_t}{PPI_t / PPI_{t-4}} \right) - \underset{(-9.6413)}{1.3158} \ln \left( \frac{PPI_t}{PPI_{t-4}} \right) + \\ &+ \underset{(3.6767)}{0.7984} d_{95} \ln \left( \frac{I + RKZ_t}{PPI_t / PPI_{t-4}} \right) \end{aligned}$$

$$R^2 = 0.953 \quad \text{adj.} R^2 = 0.945 \quad DW = 1.685$$

Following conclusions can be drawn from the above equation:

- 94% of the dependent variable was explained by independent variables.
- Real GDP level did not significantly affect the growth rate of real credits given to enterprises.
  - Increase in the growth rate of USD exchange rate by 1% led to approximately 0.47% rise of growth rate of credits obtained by enterprises. Elasticity of the endogenous variable with respect to real interest rate amounted to –1.09, except for 1995 when it had the value of –0.29.
  - Inflation rate significantly influenced the growth rate of credits given to enterprises. Its 1% rise diminished credits growth rate by 1.32%.

Following relations were assumed to hold in the equation describing total credits granted to enterprises and households ( $KOg$ ) [8]:

$$\begin{aligned} \Delta_4 \ln \left( \frac{KOg_t}{Defl_t} \right) = & \psi_0 + \psi_1 \ln(PKB_t) + \psi_2 \Delta_4 \ln \left( \frac{USD_t}{Defl_t} \right) + \\ & - \psi_3 \ln \left( \frac{I + RKZ_t}{Defl_t / Defl_{t-4}} \right) + \psi_4 d_{95} \ln \left( \frac{I + RKZ_t}{Defl_t / Defl_{t-4}} \right) + \\ & - \psi_5 \ln \left( \frac{Defl_t}{Defl_{t-4}} \right) + \xi_t^{KOg} \quad \psi_0, \psi_5 \in \mathfrak{R}; \quad \psi_1, \psi_2, \psi_3, \psi_4 > 0 \quad (14) \end{aligned}$$

where:

$KOg_t$  – level of nominal total credits given to enterprises and households in period  $t$ , in million PLN,

$\psi_0, \psi_1, \dots, \psi_5$  – structural parameters of the above equation,

$\xi_t^{KOg}$  – random error term,

other symbols as above.

The results of estimation are presented below:

$$\begin{aligned} \Delta_4 \ln \left( \frac{KOg_t}{Defl_t} \right) = & 1.369 - 0.079 \ln(PKB_t) + 0.624 \Delta_4 \ln \left( \frac{USD_t}{Defl_t} \right) + \\ & - 1.410 \ln \left( \frac{I + RKZ_t}{Defl_t / Defl_{t-4}} \right) + 1.271 d_{95} \ln \left( \frac{I + RKZ_t}{Defl_t / Defl_{t-4}} \right) + \\ & - 1.435 \ln \left( \frac{Defl_t}{Defl_{t-4}} \right) \\ R^2 = 0.957 \quad adj.R^2 = 0.942 \quad DW = 2.013 \end{aligned}$$

Following conclusions are drawn from these results:

– The estimated equation determined the behaviour of growth rate of real total credits in 94%.

– The level of real GDP did not significantly affect endogenous variable. Other independent variables influenced it in a significant way.

– 1% increase in the growth rate of USD exchange rate raised the growth rate of total zloty credits by approximately 0.62%; the elasticity between dependent variable and real interest rate amounted to  $-1.41$ , except for the year 1995 when it was  $-0.14$ .

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[8] Nominal variables were deflated with the same index, which was used in the equation of total deposits.

– The rate of inflation significantly influenced the growth rate of total credits. Increase in inflation by 1% led to 1.44% decline in the growth rate of credits.

### **3.5. Conclusions**

Following conclusions may be drawn from conducted research:

– Analysis of household deposits in Poland in the years 1994–1998 shows that the structure of these deposits has changed. The share of foreign currency deposits declined and the share of zloty deposits rose. It seems to be to some extent caused by the real appreciation of zloty. The policy, which made the zloty to appreciate in real terms, led to higher real interest rate on zloty deposits in comparison with the rate on foreign currency deposits. The development of Polish banking sector appears to be important for changes in the structure of deposits. This development leads to converting dollar savings kept in home into zloty deposits.

– The growth rate of household zloty deposits is sensitive to changes in real interest rate and exchange rate. GDP growth and banking sector development significantly affect the growth of deposits as well.

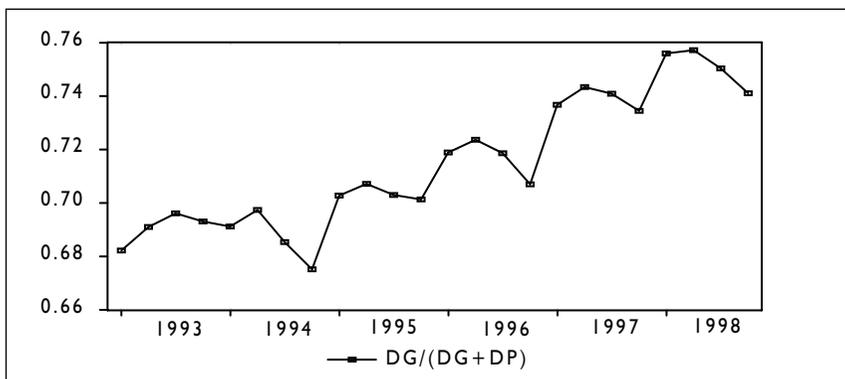
– The growth rate of enterprise deposits is indifferent to banking sector development and fluctuations in the exchange rate. It may be caused by the fact that enterprises (contrary to households) are obliged to have banking accounts, and their financial surpluses are placed in banks no matter what is the degree of banking sector development. The lack of real exchange rate's influence on analysed variable may be explained by enterprises' unwillingness to undertake risk associated with foreign currency trading.

– Moreover, non-financial sector enterprises are less sensitive than households to changes in real interest rate and (to some extent) to different levels of GDP. It may be caused by the fact that the primary purpose of firms' activity is to use their financial surpluses for production, and do not engage in speculation on interest rate changes.

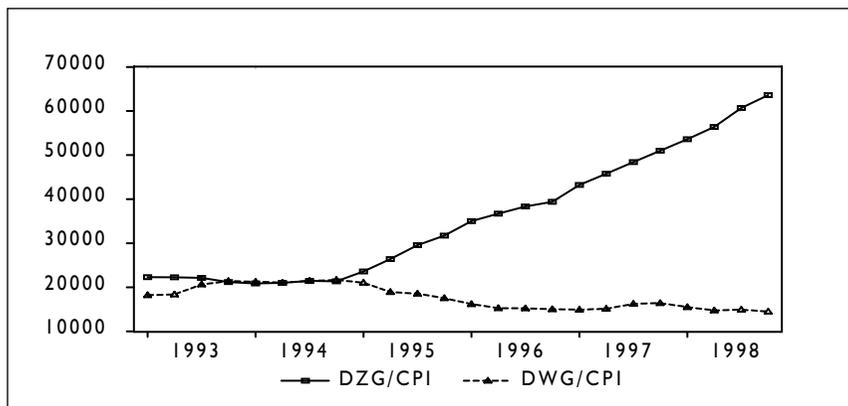
– Analysis of factors determining credits given to households shows that households react neither to changes in real interest rate, nor to fluctuations of real GDP. The most important factor affecting growth of credits is banking sector development and availability of credits. It is worth underlining that equation of growth rate of credits granted to households estimated by authors explains only about 75% of the variation of the above mentioned variable. It means that there can exist other significant factors influencing the amount of credits, such as, difficult to measure, expected growth rate of future incomes.

– The growth rate of zloty credits given to enterprises is not affected by current levels of GDP, but it is highly correlated with growth rate of real exchange rate, inflation rate, and real lending rate. Growth rate of real exchange rate positively influences the growth rate of zloty credits obtained by enterprises. This relation indicates that economic agents treat these two kinds of credits as substitutes. A rise in price of foreign currency credit (measured among others by changes in real exchange rate) leads to increased demand for zloty credits. Curbing high inflation relieves uncertainty concerning economic activity, raises demand for investment and credits obtained by enterprises. Negative influence of real lending rate on growth rate of credits is obvious.

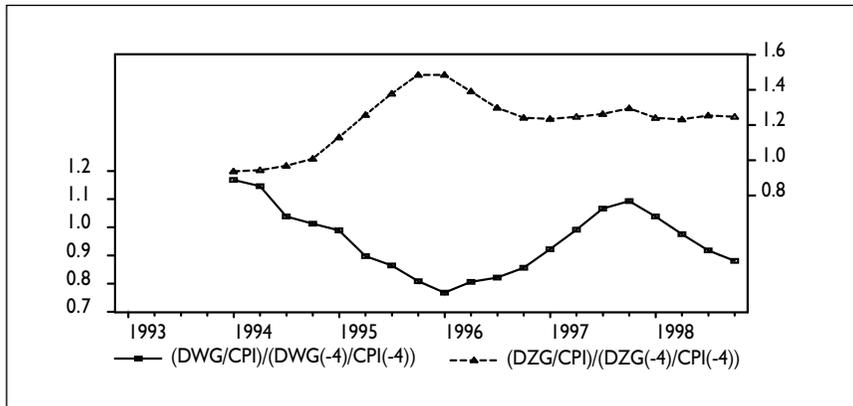
**Figure 1. The share of household deposits in total deposits**



**Figure 2. Real zloty deposits (DZG/CPI) and foreign currency deposits (DWG/CPI) held by households**



**Figure 3. Growth rates of real foreign currency and zloty deposits held by households**



**Figure 4. Real zloty (DZP/PPI) and foreign currency (DWP/PPI) deposits held by enterprises**

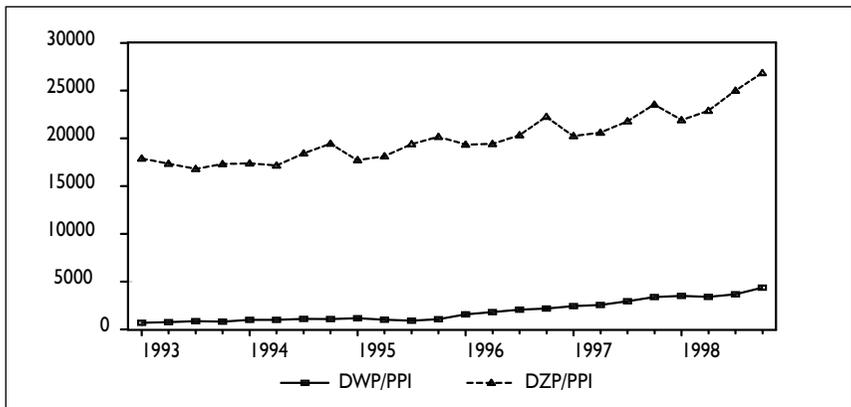


Figure 5. Real zloty credits given to households

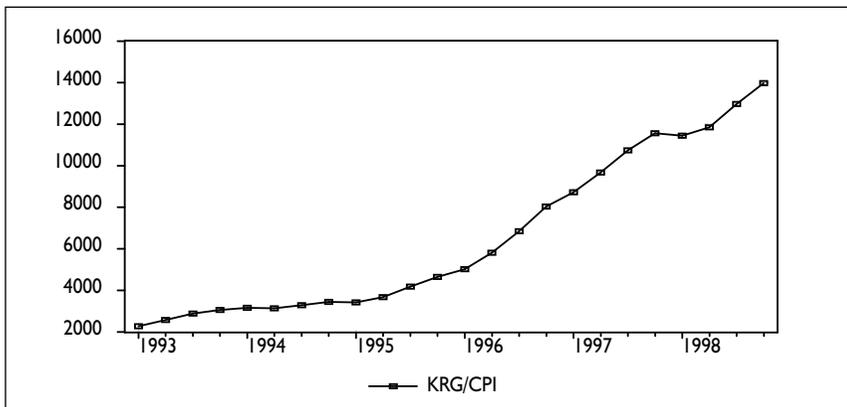
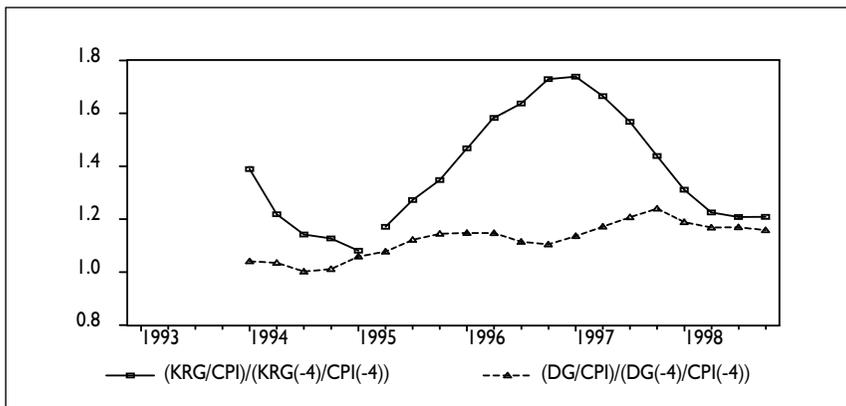
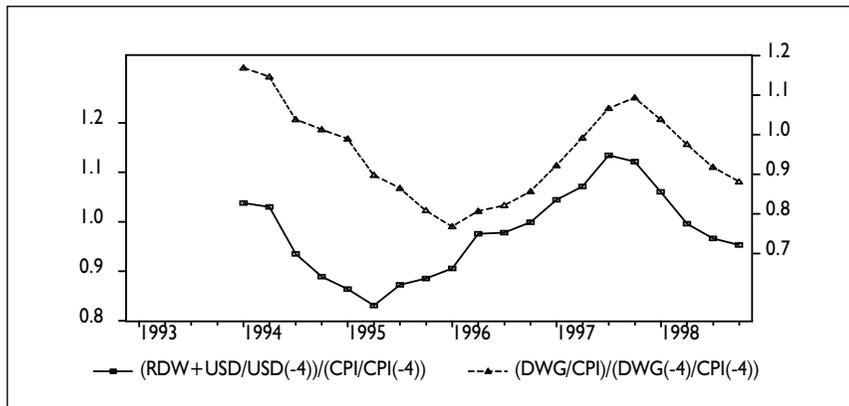


Figure 6. Comparing dynamics of real credits and real deposits held by households





**Figure 9. Comparing actual interest rate on foreign currency deposits deflated with CPI and dynamics of real foreign currency deposits held by households**



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