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EFFECTS OF THE INTRODUCTION OF A FUNDED PILLAR ON THE RUSSIAN HOUSEHOLD SAVINGS: EVIDENCE FROM THE 2002 PENSION REFORM

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Abstract

This paper provides an estimation of the effects of the introduction of a mandatory funded pillar on households' savings. To this purpose, I exploit the 2002 Russian pension reform that introduced a funded component along the pay-as-you-go one. The empirical evidence shows that the introduction of the funded pillar has a negative impact on the Russian households' savings. I find that the introduction of the funded pillar entails a reduction of 1 percentage point in the saving rates of households who save and a reduction of 2.5 percentage points in the probability of having positive savings.

1. Introduction

It is well known that the social security system has effects on national savings, which in turn impact the capital stock and the productive capacity of the economy. That is why a reform of social security, beside being devised for other purposes – typically to enhance financial sustainability and inter- and intragenerational equity – may be aimed at rising national savings.

This paper is concerned with a specific kind of pension reform: the introduction of a funded component. In the system, this kind of reform is meant to raise public saving and national saving. However, it is difficult to estimate the exact effect of the reform on national savings due to several reasons. First, it strongly depends on the government

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decision about how to finance the gap between changes in revenues and expenditures that determines the changes in the deficit and, consequently, the change in public savings. Moreover, offsetting responses can arise from the household sector, since the social security system plays an important role in influencing household saving decisions.

In this paper I study the effect of the introduction of a funded pillar on household savings in Russia, by exploiting the 2002 pension reform that introduced a funded component along the pay-as-you-go one.

Since 2002, younger Russian workers have to allocate part of their total pension contributions to a mandatory funded pillar. Participation in the funded component gives the possibility both to choose an investment manager and to bequeath its resources.[1] As the funded part of pension can be managed by the special asset management companies selected by the participants, they may expect to earn a higher rate of return on their contributions. Moreover, the possibility to leave the funded part to the family members may impact negatively on the household precautionary savings. Thus, one can expect that, in this particular case, the introduction of the funded pillar may have entailed a reduction in households savings.

In fact, I find empirical evidence that Russian households decrease their savings due to the introduction of the funded pillar. By decomposing the tobit estimates, I show that the introduction of the funded component entails a reduction between 0.7 and 1.3 percentage points in the saving rates of households who save and a reduction of 2.5 percentage points in the probability of having positive savings.

The dataset used in the analysis is drawn from the Russian Longitudinal Monitoring Survey and precisely from the waves 8-13. In order to check for the consistency of the results, I consider three differently defined saving rates.

The paper is organized as follows. Sections 2 and 3 discuss the main issues concerning social security, social security reforms and households savings. Section 4 describes saving implications of the social security reform in Russia. Section 5 presents data, methodology and estimation results. Section 6 concludes.

[1] The funded part of pension may be bequeathed to someone in case the contributor dies before the normal retirement age.

2. Household saving behavior and social security

The starting point of my brief analysis of the saving behavior is the life-cycle model. According to the simpler version of the model, an individual keeps his/her marginal utility of consumption constant during his/her lifetime, so that saving is accumulated by young people and dissaving by old ones. Actually, some individuals can be life-cycle myopic (or decide not to save because of other reasons) and do not accumulate enough assets that will allow, without the help of the society, a sufficient maintenance for their old age. The existence of this problem is the main rationale for establishing a social security program. On the other hand, by enforcing myopic individuals to save, the social security system may distort their savings decisions.

Within the framework of the simple life-cycle model, increases in pensions are completely offset by the reduction in non-pension wealth. However, there are some caveats for the previous claim. For example, the illiquidity of future pension benefits might raise overall saving for households that face binding liquidity constraint; pensions may induce early retirement, which should raise savings among workers in order to finance their longer retirement period. Moreover, the substitution effect may be limited to that part of the population that does save, for example, in the case low income households do not save for retirement independently on the anticipation of future pension benefits (Kohl and O'Brien (1998)). All the aforesaid factors may modify downwards the degree to which social security benefits affect the other wealth.

Of course, there are further reasons to save other than retirement. Households may want to build up a reserve against unforeseen events such as, among others, illness, layoff, disability. In addition, households may accumulate resources to buy houses, cars and other durables. Retirement is just one motive people save for, and contributions to the social security system may only *partially* substitute personal savings.

According to the alternative views, the effect of social security on saving may be equal to zero or even positive. One possibility is simply that households are myopic and do not save for their retirement. In this case, social security provision would not entail any reduction in savings. Another possibility was described by Cagan (1965), who argues that pension provision had two opposite effects on personal saving, a substitution effect

and a recognition effect. The substitution effect reduces private saving, while the recognition effect increases saving by increasing the contributors' awareness of their retirement needs. If the recognition effect is predominant, the effect of pension wealth on other saving becomes positive.

There are a number of *cross-section* studies that analyze the degree of substitutability between pension wealth and financial wealth. These empirical analyses differ widely in their specification and the estimated magnitude of the substitutability parameter (see, among the others, Kotlikoff (1979), Dicks-Mireaux and King (1984), Hubbard (1986) and Gale (1998)). Two recent studies, Attanasio and Rohwedder (2001) for the UK and Attanasio and Brugiavini (2003) for Italy, examine the effect of pension wealth on personal household saving. Both papers show that pension wealth is a substitute for private savings. The degree of substitutability can range between 0 and almost -1, depending on the age of individuals and the specifications. Bernheim and Scholz (1992) find for the US that the offset between pensions and other wealth differs for higher-income (more educated) and lower-income (less educated) households. They show that private pensions displace personal wealth accumulation only for college educated households and not for less educated households.

3. Household saving behavior and social security reforms introducing a funding component

We have seen that the analysis of the relationship between saving decisions and social security did not bear, up to now, conclusive results. The situation is even more complicated when one wants to study the effect of social security *reforms* on savings.

Recently, many social security reforms have aimed to establish a personal-level, defined-contribution account and a large number of countries have reformed their pension systems increasing the degree of funding. Some countries have begun a transition from a PAYG to a funded system (like, for example, Chile) and some others have introduced funded pillars (as, for example, Russia).

In general, the introduction of a funded pillar is expected to raise national savings. However, the effect of this policy measure strongly depends on the way of financing

benefit payments which have been promised by the government. For example, if the government decides to borrow from public and just alters the form of the debt then national saving remains constant (Orzsag and Stiglitz (1999)). The impact also depends in part on how the introduction of a funded pillar affects non-pension savings at the household level.

Engen and Gale (1997) list several channels through which the introduction of personal accounts might affect household savings. First, the presence of a personal account may change benefit levels for participants, with no changes in the contribution amounts. Second, a shift from defined-benefit to defined-contribution (DC) plan introduces a different source of risk, and workers might change their precautionary savings. While the PAYG system is associated with demographic and political risks, participants in the funded system bear financial market risks. The PAYG system also provides insurance against earnings risk, and because of the absence of that insurance in the DC plans, the participants may increase their precautionary savings.

As for the Chilean experience, Schmidt-Hebbel (1999) claims that the social security reform has raised the national saving ratio to GDP and Coronado (2002) estimates that it increased household saving rates between 5 and 10 percentage points. But Samwick (2000) finds that no country with exception of Chile experienced an increase in national saving rates after a social security reform towards non-PAYG system.

4. Saving implications of the social security reform in Russia

In Russia, the national saving rate has been always high since the time of the former Soviet Union (for example, in the late 1980s national saving rate was about 31%). In the first years of the current century, the national saving rate has always been above 30% (Grigoryev and Gurvich (2004)).

As for the households' saving rate, during the last decade household savings have been a small share of total savings in Russia, contributing only between 7% and 11% of GDP (Kuznetsov (2002)). According to the Russian Statistical Committee, over the period 1998-2003, Russian households were consuming 85%-90% of their disposable

income, and the main share of total household savings was accumulated by the higher-income families (see Gregory *et al.* (1999), Shashnov (2003)).

In this paper, I use evidence from the Russian Federation in order to assess the impact of the funded pillar on the household savings.

In 2002, Russia shifted the pension provision from a defined benefit pension scheme to a defined contribution one introducing personal accounts. After the reform, the total rate of payroll contribution did not change, remaining equal to 28%. The new system has three pillars, a basic benefit pillar, a notional defined contribution (NDC) pillar and a mandatory funded pillar. The share of the total social security contribution allocated to each pillar depends on the individual's date of birth.

I focus on the saving behavior of specific groups of Russian households. Individuals are divided into different groups depending on how they were affected by the pension reform.

In particular, on the basis of the laws that became operative between 2002 and 2005, workers could be divided into three categories.[2] The first group consisted of "old" workers, born in 1952/1956 (men/women respectively) and earlier. They were not eligible to participate in the funded pillar, and had to contribute 14% to the basic pillar and 14% to the second NDC pillar. The second group consisted of men born in the years between 1953 and 1966 and women born in the years between 1957 and 1966. This group had to contribute 14% to the basic pillar, 12% to the NDC pillar and only 2% (over total 28%) to the funded pillar. Finally, the third group, young workers born in 1967 and later, had to allocate 14% to the basic pillar, 8% to NDC pillar and 6% to the funded pillar.

The above classification is important to my purposes, since there are several causes why participants and non-participants to the funded part of pension can adjust their savings differently.

First, if individuals behave as predicted by the life-cycle theory, they adapt their savings depending on the change of the expected pension benefits. In the new pension plan, Russian individuals are free to choose an investment manager for the funded part,

and, consequently, they can make better choices about yields and risks by giving their preferences either to the state asset management company or to private companies. Presumably, participants in the funded pillar should anticipate higher pension benefits than non-participants. Because of this, after the reform, contributors and non-contributors to the funded component should alter their non-pension savings in different ways.

Second, the funded part of pension can be bequeathed to family members in case the individual dies before of the statutory retirement age. This can be a strong reason to induce "younger" households to reduce their *savings for the rainy days*.

Third, since 2002, "younger" workers bear investment risk associated with the funded pillar instead of political and demographic risks. This additional source of risk may increase or reduce the overall level of risk faced by contributors, and thus respectively reduce or increase their precautionary saving.

Given the above considerations, we have good reasons to believe that, because of the difference in the contributions to the funded pillar, the 2002 pension reform affected differently the propensity to save of the different groups. In order to estimate the impact of the funded pillar on household savings, I exploit the difference among these groups using the difference-in-difference approach (see, for example, Meyer (1994), Blundell and Costa Dias (2000) and Wooldridge (2002)).

5. Data, methodology and estimation results

In this paper, I employ data derived from the Russian Longitudinal Monitoring Survey (RLMS), for the years 1998 and 2000-2004. This household-based survey has been organized and coordinated by the University of North Carolina and it is designed to measure the effects of Russian reforms on the economic well-being of households and individuals.

[2] In 2005, the contribution rate to the pension system changed: only individuals born since 1967 are eligible to participate to the funded pillar. I consider only the period 1998-2004.

5.1 Using different definitions of savings

In studying household saving behavior, one can rely on several alternative measures of savings. First, household saving can be defined as the change in the household wealth (as in Engelhardt (1996) and Dynan *et al.* (2000)). Very often, household saving is also constructed simply as the difference between household income and consumption (see, for example, Attanasio (1998), Attanasio and Brugiavini (2003) and Dynan *et al.* (2000)). Another possible measure of savings is the self-reported "active saving" that Disney (2003) defines as non-negative transfers from current income into financial wealth.

However, there is no full agreement on what kind of items should be included in either consumption or saving (see, for instance, Attanasio (1998), Giavazzi *et al.* (2006), Gale *et al.* (1999), Ofer *et al.* (1980)). For example, expenditure for durable goods and contributions to social security might be considered as saving and expenditure on education as investment in human capital. Capital gains on financial assets and on real estate might be also treated as saving.

Which measure of savings has to be employed might depend on the aim of the research, on the specific institutional and social characteristic of the country under study and of course on the given dataset. Certainly, the use of different measures can help to check the consistency of the results.

To perform my study, I employ three different definitions of savings. The first two definitions differ in the treatment of the expenditures for bonds, stocks and durable goods. One measure includes them whereas the other one excludes them. In both cases, I use the *self-reported household saving* in terms of rubles instead of computing the difference between household income and consumption. The saving rates are then calculated as the ratio of saving to income. The third definition is given by the self-reported measure of the *annual household saving rate*.

Let us now give some more details about the above definitions. The RLMS includes a question about the amount of money that the family saved in the previous 30 days. The precise form of the question is *"how many rubles did your family save in the last 30 days?"*. Moreover, the RLMS provides data on total household monthly income. Total income is a constructed (by the RLMS) variable that includes employment and non-employment

income of all family members. As for home produced items, total household income includes net income from selling home production and the net value of home production that has been consumed or given away.[3]

To summarize, the first two definitions of monthly saving rates are the following:

- SR1 = [amount of money saved by family in the month preceding the interview / family income in the month preceding the interview];
- SR2 = [(amount of money saved by family in the month preceding the interview + expenditure for bonds and stocks in the month preceding the interview + monthly expenditure for durable goods) / family income in the month preceding the interview]

The main weakness of SR1 and SR2 is that they do not include household savings in hard currencies (dollars, euros and etc.) and may undervalue the household saving rates, since, according to the Russian Statistical Committee, over the last decade, a large portion of the Russian household savings consisted of hard currencies.

As for the third definition, I exploit further information provided by the RLMS waves since 1998 in which there was a question about the annual household saving rates. More precisely, in the above waves, respondents were asked about the percentage of all family income that their family saved during the preceding year. The question was: *"If we talk about the last 12 months, which part of your family's income managed to be set aside: at home or in a bank deposit, in rubles or currency or securities? What percentage of all the family's income would this be roughly?"*. So, the third definition of saving rate is the following:

- SR3 = self-reported annual saving rate (in the year preceding the interview).

In this paper, I use household saving rates net of the social security, social security contributions are not counted as household saving and social security benefits are counted as household income.

5.2 Methodology, summary statistics and estimation results

The difference-in-difference model measures the impact of a given policy or rule when it is imposed to a so called *treatment group* but not to an other *non-treatment* (or *control*) group.

[3] Net means that the expenditures of using land, seeds and etc. are subtracted.

In using the *diff-in-diff* approach, the crucial assumption for the consistency of the estimator is that two groups are comparable over time in absence of the treatment because, otherwise, the change in the outcome of the different groups between pre-treatment and post-treatment periods might be driven by other unobservable factors. In my case, in order to isolate the net effect of the treatment, I control for the demographic variables.

The household's characteristics are defined as the characteristics of its head[4]. I allocate all households into two groups. In the first estimation, I allocate household, whose head is not eligible to contribute to the funded pillar into the control group. The treatment group, instead, consists of households whose head contributes to the funded part of the pension. To summarize:

$$\left\langle \begin{array}{c} \text{Control group 1 : old workers (do not contribute to the funded pillar)} \\ \text{Treatment group 1 : young workers (contribute 6\%) \& middle age workers (contribute 2\%)} \end{array} \right\rangle$$

While, in the second estimation, I reallocate heads men born between 1953 and 1966 and heads women born in the years between 1957 and 1966, who contribute to the funded part only 2%, from the treatment group to the control group. I do this since the amount of their contributions is significantly lower than for the treatment group. In summary:

$$\left\langle \begin{array}{l} \text{Control group 2 : old workers \& middle age workers} \\ \text{Treatment group2 : young workers} \end{array} \right\rangle$$

The saving rate SR_i is modeled by the following equation:

[4] In Russia, it is very problematic to identify one person as the "household head". In the RLMS, the head of household is based strictly on age and gender, and is assigned according to the following hierarchy: 1. The head of household is the oldest working-aged male; 2. If there are no working-aged males in the household, then the head of household is the oldest working-aged female; 3. If there are no working-aged males or females, then the head of household is the youngest retirement-aged male; 4. If there are no working-aged males or females, and no retirement-aged males, then the head of household is the youngest retirement-aged female; 5. Finally, if there are no working-aged males or females, and no retirement-aged males or females, then the head of household is the oldest child.

$$SR_i = \alpha + \beta T_i + \gamma t_i + \delta(T_i t_i) + X_i' \lambda + \xi_i$$

where *i* indexes the household, T_i is a dummy equal to 1 if household belongs to the treatment group and 0 otherwise, β is the treatment group specific effect, t_i is a dummy equal to 1 for the post-reform period, γ is a time trend common to control and treatment groups, δ is the coefficient of interest, that provides the treatment effect and ξ_i is an unobservable error term.

As I have mentioned before, in order to isolate the net effect of the treatment I control for demographic factors. The vector of demographic characteristics X_i contains: - a polynomial in the age of the household head; - the gender of the head; - his/her education (if household head studied at university); - the type of settlement (urban/non-urban); - if family lives in the metropolitan area (Moscow and St.Petersburg); - the marital status; - if household head has a job; - the share of earners and share of children in the family.

I restrict the sample to individuals that are not retired and, potentially, should be contributors to the pension system. I do not include observations if the head is younger than 21 and older than the statutory retirement age (55/60 years women/men respectively). I drop the observations for which monthly household saving exceeds the total family income in that month.

The summary statistics for the samples used in the estimations are presented in Table 1. Note that: - about 80% of the household heads are male; - about 30% of heads have higher education; - about 80% of heads are employed. Finally, we note that the majority (about 70%) of the households are urban dwellers and about 10% of the them live in a metropolitan area (Moscow and St.Petersburg).

I want to highlight that a very substantial portion (more than 80%) of the respondents reported their household savings to be equal to zero. There are several reasons why we have such a high number of non-savers in the RLMS. First, zero savings may be the household's optimal choice. Second, there are households that do not put aside because they do not have the possibility to save. Third, the RLMS's questionnaires

exclude the possibility of reporting negative savings and, thus, we may observe zero savings also for dissavers. Nevertheless, the large number of observations and the tobit technique allow us to get consistent estimates.

Table 1: Summary statistics for the samples used in estimations, Russia 1998, 2000-2004

Specification 1 (Treatment group/Control group)

	SR1		SR2		SR3	
Variable	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*
Saving rate	0.033/0.025	0.12/0.09	0.049/0.037	0.14/0.11	0.026/0.024	0.09/0.08
age	35.5/52.0	7.8/3.6	35.5/52.0	7.8/3.6	35.4/52.0	7.8/3.6
higher education	0.27/0.25	0.44/0.44	0.27/0.25	0.44/0.44	0.27/0.25	0.44/0.43
gender (male)	0.84/0.71	0.37/0.46	0.84/0.70	0.37/0.46	0.84/0.70	0.37/0.46
urban dweller	0.71/0.70	0.45/0.46	0.70/0.70	0.45/0.46	0.71/0.70	0.45/0.46
live in metropolitan area	0.11/0.11	0.31/0.2	0.11/0.11	0.31/0.2	0.11/0.11	0.31/0.32
married	0.73/0.68	0.44/0.47	0.73/0.68	0.45/0.47	0.73/0.67	0.45/0.47
head works	0.78/0.77	0.41/0.42	0.78/0.77	0.42/0.42	0.78/0.77	0.42/0.42
share of children in the family	0.26/0.12	0.20/0.18	0.26/0.12	0.20/0.18	0.26/0.12	0.20/0.18
share of earners in the family	0.66/0.76	0.22/0.23	0.66/0.76	0.22/0.23	0.66/0.76	0.22/0.23
Number of observations	10745/2381		10534/2350		10125/2275	
Number of observations with non-zero savings	1239/244		2210/439		1564/340	

Specification 2 (Treatment group/Control group)

	SR1		SR2		SR3	
Variable	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*
saving rate	0.037/0.028	0.12/0.11	0.056/0.040	0.15/0.13	0.027/0.025	0.08/0.08
age	28.6/44.7	4.2/6.2	28.6/44.7	4.2/6.2	28.6/44.8	4.2/6.2
higher education	0.30/0.25	0.46/0.43	0.30/0.25	0.46/0.43	0.29/0.25	0.45/0.43
gender (male)	0.82/0.81	0.39/0.39	0.82/0.81	0.39/0.39	0.82/0.81	0.39/0.40
urban dweller	0.72/0.69	0.45/0.46	0.72/0.69	0.45/0.46	0.73/0.70	0.45/0.46
live in metropolitan area	0.10/0.12	0.30/0.32	0.10/0.12	0.30/0.32	0.10/0.12	0.30/0.32
married	0.69/0.74	0.46/0.44	0.68/0.74	0.46/0.44	0.69/0.74	0.46/0.44
head works	0.77/0.78	0.42/0.41	0.77/0.78	0.42/0.41	0.77/0.78	0.42/0.42
share of children in the family	0.26/0.23	0.20/0.21	0.26/0.23	0.20/0.21	0.26/0.22	0.20/0.21
share of earners in the family	0.66/0.68	0.22/0.23	0.66/0.68	0.22/0.23	0.66/0.68	0.22/0.23
Number of observations	5100/8026		4975/7909		4822/7578	
Number of observations with non-zero savings	690/793		1173/1476		753/1151	

The results of the estimations and the Tobit decomposition are reported in Table 2.

The coefficient of interest δ, that provides the net effect of the funded pillar, has a negative sign. Thus I find evidence that the difference between the changes in the saving rates for the treatment group (those contributing to the funded pillar) and for the control group (those not contributing) is negative. For the majority of the estimations, δ is statistically significant. The other coefficients in the regressions have the expected signs.

The negative coefficient for the effect of introduction of the funded pillar comes not with a surprise. First of all, participants to the funded pillar can choose an investment manager, and they will presumably earn higher rates of return on their contributions than those not contributing to the funded pillar. Second, the possibility to bequeath the funded part of pension to the members of family has a negative effect on the household precautionary saving.

Let us now consider the decomposition of the Tobit estimates (see appendix A for details). The Tobit model provides a single coefficient for each independent variable in spite of two different types of dependent variables: censored and uncensored. In order to interpret the Tobit coefficients, we have to compute two types of effects of the introduction of the funded pillar: 1) the changes in the expected value of saving rates of those having positive savings ($\partial E(SR^*)/\partial(Tt) = \delta^*[1 - z\phi(z)/\Phi(z) - \phi^2(z)/\Phi^2(z)]$)[5]; 2) the changes in the probability of having positive savings ($\partial\Phi(z)/\partial(Tt) = \delta^*\phi(z)/\hat{\sigma}$).

From the second last row of Table 2, we can see that only about 20%[6] of the total change in saving rates, resulting from a change in the independent variables, is generated by marginal changes of the positive savings, whereas about 80% is generated by changes in the probability of having positive savings.

On the basis of this decomposition (see Table 3) I find that, depending on the definition of savings and specification, the introduction of a funded component has involved a reduction of the Russian household saving rates by about 1% due to those

[5] $E(SR^*) = E(SR / SR > 0)$

[6] 18% for SR1, 22% for SR2 and 20% for SR3.

households that saved in the analyzed sample. Moreover, the probability of having positive savings has fallen by about 2.5%.

Table 2: Estimation results

	SR1		SR2		SR3	
	Control group 1	**Control group 2**	**Control group 1**	**Control group 2**	**Control group 1**	**Control group 2**
Variable	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*
T (treatment group)	-0.019	0.097**	-0.011	0.080***	0.009	0.024
	(-0.44)	(2.46)	(-0.39)	(3.05)	(0.39)	(1.05)
t (post-reform period)	0.106***	0.064***	0.081***	0.064***	0.074***	0.062***
	(2.84)	(3.07)	(3.36)	(4.75)	(3.31)	(5.51)
T*t	-0.072*	-0.068**	-0.028	-0.037*	-0.030	-0.035*
(treatment effect)	(-1.76)	(-2.12)	(-10.6)	(-1.72)	(-1.31)	(-1.89)
age	1.406***	1.321***	0.934***	0.765***	0.696***	0.751***
	(3.76)	(3.26)	(3.77)	(2.86)	(3.19)	(3.23)
age^2	-0.372***	-0.343***	-0.251***	-0.196***	-0.170***	-0.184***
	(-3.79)	(-3.13)	(-3.88)	(-2.72)	(-2.97)	(-2.96)
age^3	0.030***	0.028***	0.021***	0.016***	0.013***	0.014***
	(3.62)	(2.99)	(3.80)	(2.60)	(2.69)	(2.70)
higher education	0.075***	0.077***	0.066***	0.067***	0.100***	0.100***
	(4.43)	(4.50)	(5.91)	(5.96)	(10.39)	(10.41)
gender (male)	-0.018	-0.023	0.014	0.012	-5E-04	-4E-04
	(-0.66)	(-0.87)	(0.77)	(0.71)	(-0.03)	(-0.03)
urban dweller	0.020	0.021	0.014	0.014	-0.001	-0.001
	(1.10)	(1.14)	(1.14)	(1.18)	(-0.13)	(-0.11)
live in metropolitan area	-0.039	-0.040	-0.075***	-0.075***	-0.012	-0.012
	(-1.58)	(-1.61)	(-4.36)	(-4.35)	(-0.90)	(-0.91)
married	0.081***	0.080***	0.067***	0.067***	0.062***	0.062***
	(3.33)	(3.29)	(4.27)	(4.23)	(4.52)	(4.52)
head works	0.127***	0.127***	0.108***	0.108***	0.054***	0.053***
	(6.07)	(6.06)	(7.82)	(7.80)	(4.69)	(4.65)
share of children in the family	-0.085	-0.082	-0.017	-0.016	-0.151***	-0.150***
	(-1.53)	(-1.48)	(-0.47)	(-0.43)	(-5.00)	(-4.97)
share of earners in the family	0.075	0.070	0.036	0.030	-0.021	-0.021
	(1.55)	(1.44)	(1.12)	(0.93)	(-0.79)	(-0.79)
const	-2.481***	-2.506***	-1.611***	-1.532***	-1.328***	-1.398***
	(-5.35)	(-5.21)	(-5.21)	(-4.79)	(-4.88)	(-5.01)
Number of observations	13126		12884		12400	
Log likelihood	-4074.1	-4072.8	-5165.2	-5161.3	-3683.7	-3682.7
Pseudo– R^2	0.019	0.019	0.025	0.025	0.032	0.033
$\hat{\sigma}$	0.542	0.542	0.415	0.415	0.320	0.320
Decomposition						
Fraction of sample above limit and adjustment factor for unconditional expected value : $[\Phi(z)]$	0.12	0.11	0.20	0.20	0.16	0.16
Fraction of mean total response due to response above limit and adjustment factor for cases above the limit: $[1 - z\phi(z)/\Phi(z) - \phi^2(z)/\Phi^2(z)]$	0.18	0.18	0.22	0.22	0.20	0.20
Adjustment factor for cases at the limit: $[\phi(z)/\sigma]$	0.36	0.36	0.68	0.68	0.75	0.75

Tobit regression with robust standard errors. t statistics in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%. Here, the single adjustment factors are evaluated at the estimates and the mean values of the independent variables (but I use $\overline{age^2}$ and $\overline{age^3}$ rather than use the averages of the age^2 and age^3).

Table 3: Results of the tobit decomposition

	Control group 1 {Control group 2}	
Saving Rate Definition	$\partial E(SR^*)/\partial(Tt)$	$\partial\Phi(z)/\partial(Tt)$
SR1	-1.3%*{-1.2%**}	-2.6%*{-2.5%**}
SR2	-0.6%{-0.8%*}	-1.9%{-2.5%*}
SR3	-0.6%{-0.7%*}	-2.3% {-2.6%*}

* significant at 10%; ** significant at 5%

6. Conclusive remarks

In this paper, I estimate the impact of the introduction of the funded component on household saving rates using a dataset derived from the Russian Longitudinal Monitoring Survey for the years 1998 and 2000-2004.

To this purpose, I apply the difference-in-difference approach. The main problem in using the difference-in-difference estimator is to insure the parallel trend assumption. In my case, the control group is significantly different from the treatment group and a simple application of the difference-in-difference approach would be misleading. Therefore, I turn to a regression-based approach, where I control for demographic characteristics in order to isolate the net effect of the treatment. The systematic difference between the life-cycle stages of control and treatment groups is neutralized with a polynomial in age.

Despite that a very substantial portion of the respondents in the RLMS report their saving to be equal to zero, the large number of observations and Tobit technique allow to get reliable estimations of the impact of the introduction of a funded pillar on the Russian households' savings.

The evidence resulting from the estimates suggests that the introduction of the funded component along the pay-as-you-go component has impacted negatively on Russian households savings.

Using McDonald and Moffitt's adjustments for the tobit estimates, I find that, due to the introduction of the funded pillar, the saving rates of those who save have dropped by

about 1 percentage point and that the probability to put aside has fallen by about 2.5 percentage points.

Appendix A: The Tobit regression model

For the empirical analysis, I use the standard tobit regression censored on left at zero (see Maddala (1983); Verbeek (2002) and Wooldridge (2002)), which, for my case, I formalize in the following way:

$$\begin{aligned} SR_i &= Z_i'\alpha + \xi_i \quad if \quad Z_i'\alpha + \xi_i > 0 \\ SR_i &= 0 \qquad\quad if \quad Z_i'\alpha + \xi_i \le 0 \\ & \quad i = 1, 2, ..., N \end{aligned} \tag{A1}$$

where Z_i is a vector of independent variables, ξ_i is an error term assumed to be $NID(0, \sigma^2)$ and N is the number of observations.

The Tobit model describes two things :

a) the probability that $SR_i = 0$:

$$\Pr(SR_i = 0) = \Pr(\frac{\xi_i}{\sigma} \le -\frac{Z_i'\alpha}{\sigma}) = 1 - \Phi(\frac{Z_i'\alpha}{\sigma}) \tag{A2}$$

where $\Phi(\cdot)$ is the cumulative standard normal distribution function.

b) the expected value of SR_i, in the case it is positive**:**

$$E(SR_i^*) = E(SR_i / SR_i > 0) = Z_i'\alpha + E(\xi_i / \xi_i > -Z_i'\alpha) = Z_i'\alpha + \sigma \frac{\phi(Z_i'\alpha / \sigma)}{\Phi(Z_i'\alpha / \sigma)} \tag{A3}$$

where $\phi(\cdot)$ is the standard normal probability density.

From the above formula, one can also derive :

$$E(SR_i) = Z_i'\alpha\Phi(Z_i'\alpha / \sigma) + \sigma\phi(Z_i'\alpha / \sigma) \tag{A4}$$

The Tobit model is estimated by the maximum likelihood.

As it was shown above, the probability to observe a SR_i that is equal to zero is:

$$\Pr(SR_i = 0) = 1 - \Phi(\frac{Z_i'\alpha}{\sigma}) \tag{A5}$$

For the observations SR_i that are greater than zero we instead have:

$$\Pr(SR_i > 0) f(SR_i / SR_i > 0) = \Phi(Z_i'\alpha / \sigma) \frac{f(SR_i)}{\Phi(Z_i'\alpha / \sigma)} = \frac{1}{(2\pi\sigma^2)^{1/2}} e^{-(1/2\sigma^2)(SR_i - Z_i'\alpha)^2}$$

(A6)

Then the log-likelihood to maximize with respect to α and σ^2 takes the following form:

$$\log L(\alpha, \sigma^2) = \sum_{SR_i=0} \log\left[1 - \Phi\left(\frac{Z_i'\alpha}{\sigma}\right)\right] + \sum_{SR_i>0} \log\left[\frac{1}{(2\pi\sigma^2)^{1/2}} \exp\left(-\frac{1}{2}\frac{(SR_i - Z_i'\alpha)^2}{\sigma^2}\right)\right]$$

(A7)

McDonald and Moffitt (1980) showed that the effect of an independent variable on the expected value of the dependent variable for all observations is provided by

$$\partial E(SR_i)/\partial Z_{ik} = \Phi(z_i)(\partial E(SR_i^*)/\partial Z_{ik}) + E(SR_i^*)(\partial \Phi(z_i)/\partial Z_{ik}) \qquad (A8)$$

where $z_i = Z_i'\alpha/\sigma$. In practice, a single adjustment factor is obtained at $z = \bar{Z}'\hat{\alpha}/\hat{\sigma}$ where $\bar{Z}$ denotes the vector of mean values.

$\partial E(SR^*)/\partial Z_k$ is the change in the expected value of SR for cases above the limit (with positive savings). $\partial\Phi(z)/\partial Z_k$ is instead the change in the cumulative probability of being above the limit (having a positive savings) associated with an independent variable.

McDonald and Moffitt (1980) provided formulas for calculating these two terms.

For cases above the (zero) limit:

$$\partial E(SR^*)/\partial Z_k = \alpha_k * [1 - z * \frac{\phi(z)}{\Phi(z)} - \frac{\phi^2(z)}{\Phi^2(z)}] \qquad (A9)$$

For cases at the (zero) limit:

$$\partial \Phi(z)/\partial Z_k = \alpha_k * \phi(z)/\sigma$$

The total effect $\partial E(SR)/\partial Z_k$ is equal to $\alpha_k \Phi(z)$.

It is easy to show (by dividing both sides of *(A8)* by $\alpha_k\Phi(z)$) that the fraction of the total effect due to the effect above the limit is just $[1 - z * \frac{\phi(z)}{\Phi(z)} - \frac{\phi^2(z)}{\Phi^2(z)}]$, and this is

also the fraction by which the α_k coefficient must be adjusted (see *(A9)*) to obtain correct regression effects for observations above the limit (McDonald and Moffitt (1980).

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