Household Welfare and Income Shocks
The Case of Russia

PhD Thesis

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Für Heidi und Manfred

Abstract

The thesis investigates the impact of changes in household income on household welfare in Russia during 1994 to 1998. Part I introduces the main estimation techniques (Instrumental Variables, Difference-In-Differences and Matching), the data sources and the context of the Russian arrears crisis. Part II contains the empirical analysis. Chapter 5 simulates the effect of government cash transfers on poverty with Instrumental Variables estimation, taking into account consumption smoothing of households. Changes in cash transfer policy led unambiguously to a rise in poverty between 1994 and 1998. Chapter 6 explores the welfare effects of non-payments of pensions in 1996 using a Difference-In-Differences model. The loss of pension income doubled poverty rates and worsened nutrition among affected pensioners. Elderly men suffered from a decline in health and were more likely to die in the two years following the crisis. Households responded in ways that mitigated the impact of the crisis, replacing one-fifth of lost pension income through increased labour supply and asset sales. Chapter 7 analyses the impact of wage arrears on the elderly who were either working themselves or living together with workers. Matching techniques establish that wage arrears had a detrimental impact on old age welfare, including current and future health, over a wide range of control variables and sample restrictions. In line with the findings on pension arrears, the effect was larger on men than on women. Arrears households compensated about 10 to 14 percent of the wage loss from other income sources. Chapter 8 studies the link between wage arrears and child health. Wage arrears resulted in a decline of economic well-being, nutrition and growth status of affected children. Arrears households replaced up to one fifth of the wage reduction with other receipts. The final chapter summarizes the main findings.

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Overview

Chapter 1

Preface

1.1 Introduction

With the fall of the Berlin wall in 1989, the 500 million people from Central Europe to Central Asia embarked on a transition from central planning to the market economy. While the old socialist system disintegrated quickly, new institutions were slow to emerge (World Bank 2002b and World Bank 1997). Many countries of the Former Soviet Union faced a prolonged decline in GDP, rising poverty and demographic and health crises (Klugman et al. 2002). Understanding the links between socioeconomic status and welfare became central for protecting the well-being of workers, elderly, mothers and children.

The economic literature has emphasized the difficulties in identifying the channels and directions of causality that underlie this relationship (Strauss and Thomas 1995). However, the bulk of the empirical evidence is based either on cross-sectional data or on changes of agricultural income in developing countries. Only few historic episodes spanning multiple data points have been analysed, and little is known whether the findings generalize to economies where households rely primarily on non-farm resources.

The thesis contains an integrated empirical study of the role of economic resources for household welfare in Russia from 1994 to 1998. This period presents a rare chance to study the impact of exogenous income shocks on well-being. In the early 1990s, Russian

families lived through the creation of a new nation, double-digit negative GDP growth rates, and the first-generation reforms of price liberalization and large-scale privatization. After a few years, the economy began to stabilize and price signals in nascent market systems started to guide household decisions. However, the state sector run into severe budgetary problems, and enterprises suffered from low profitability. Payment arrears of pensions and wages, the main source of livelihood for most Russians, became widespread. The analysis traces the impact of shortfalls in household income on multiple dimensions of living standards. Even though the evidence is specific to Russia in the mid-1990s, this episode provides policy lessons relevant to other countries and periods.

1.2 Overview

The remainder of this chapter gives a preview over the content of the thesis and explains how it contributes to the economic literature on household welfare in Russia. The next chapter introduces the three principal estimation techniques used in the analysis (Instrumental Variables, Difference-In-Differences and Matching). Chapter 3 presents the Russian Longitudinal Monitoring Survey (RLMS), the main data source, and discusses the construction of welfare measures. Chapter 4 lays out the context of Russia's arrears crisis during the mid-1990s, emphasizing the link to the financial malaise of the public sector. Some payment arrears, like pensions and child benefits, were directly related to the shortfall of government cash revenues, as they were financed from budgetary funds. Others, like wages arrears, originated in enterprises or institutions, such as schools and hospitals, that were either fully or partially owned by the public sector or provided goods and services to the public sector. Furthermore, the fiscal crisis generated an economic climate, characterized by liquidity shortages, high-yielding financial investment opportunities and low returns of the enterprise sector, in which payment arrears could flourish.

Chapter 5 to Chapter 8 of Part II contains the main empirical analysis. The chapters study different income sources, population

subgroups and time periods, and employ different methodologies and identification strategies (Table 1.1). Chapter 5 looks at the impact of government transfers on poverty during 1994 to 1998 for the entire population of about 147 million persons. It uses Instrumental Variables estimation. Chapter 6 to Chapter 8 employ a treatment-control group set up. Chapter 6 and Chapter 7 analyse the welfare of the elderly using alternative income sources, approaches and time periods. Chapter 6 studies the period of 1995 to 1996, the peak of the pension crisis. Chapter 7 and Chapter 8 cover the time span of the wage arrears crisis from 1994 to 1998, differing only with regard to the population subgroup investigated (the elderly versus children aged less than 7 years). As explained in Chapter 2, the matching estimators account for heterogeneity in the impact of wage arrears. The final chapter summarizes the main findings of the thesis and draws policy lessons.

Table 1.1: Empirical analysis: overview

	Chapter 5	Chapter 6	Chapter 7	Chapter 8
Income source	Government cash transfers	Pensions	Wages	Wages
Methodology	IV	DID	CS Matching DID Matching	CS Matching DID Matching
Heterogeneity	No	No	Yes	Yes
Identification	Regional and personal characteristics; Entitlement rules	Donor and debtor regions; Programme rules	Regional, enterprise and personal characteristics	Regional, enterprise and personal characteristics
Pop. subgroup	Entire population	Pensioner households	Elderly in worker households	Children in worker households
Pop. share (mn.)	147	38	18	10
Time period	1994-98	1995-96	1994-98	1994-98

Note: IV stands for Instrumental Variables; DID for Difference-in-Differences; and CS for cross-sectional.

Individual welfare is a multidimensional concept. Economists tend to favour measures of well-being that are closely oriented on economic theory, and for practical reasons often use consumption or income. Yet, going beyond these standard measures is useful for various reasons. Following Sen (1999), increasing economic resources is essential as a means to enhancing individual welfare, but it is just an instrument and not the desired outcome. Measures of education or health are closer to the overarching objective of expanding the real freedoms, or capabilities, enjoyed by the members of the society.

This wider notion of welfare has been embraced by the international community in the Millennium Declaration of the United Nations in September 2000, which defines human development along seven goals in the areas of poverty, nutrition, education, health, gender and environment, quantified using 31 indicators.[1]

The thesis recognizes that welfare is more than just economic resources. Economic changes are integrated into a broader picture of the expansion or deprivation of capabilities. Chapter 5 focuses on consumption as outcome measure which is likely to capture longer-term welfare more accurately than income. Chapter 6 to Chapter 8 characterise welfare changes for the elderly and children, separately for men and women and boys and girls, in terms of poverty, income, nutrition and health outcomes (Table 1.2). The analysis also investigate coping mechanisms, health service, health behaviour and self-rated environment (for Chapter 7 and Chapter 8) as inputs into health and welfare outcomes. With the exception of education, the analysis covered aspects of all sectors of the Millennium Declaration.[2]

There are other advantages of considering a broad set of welfare measures. As argued in Section 3.3, welfare is a characteristic of individuals, not of families. Household income and consumption are typically converted into individual measures of welfare by dividing through household size, assuming that households share resources equally among members. However, this ignores the possibility that intra-household inequality leads to larger deprivation of some members than others. Alternative measures, like health outcomes, are collected for individuals rather than households, allowing one to dis-

[1] An eight goal concerns the global development partnership.

[2] Environment was covered through subjective assessments as part of the discussion of identification issues of the wage arrears chapters. Education was not considered as outcome variable for two reasons. The population subgroups under investigation (the elderly and children less than 7 years of age) are outside of school age. It is also unlikely household-level income shocks had a large impact on education. The bulk of primary and secondary education is provided for free by state schools. Enrolment rates remained high throughout the period of the 1990s. For example, 98 percent of the children aged 7 to 15 years were enrolled in education in 1998. While the quality of education may have been affected, the RLMS provides little information on this issue. Cheidvasser and Benitez-Silva (2000) study returns to education during the 1990s in Russia.

Table 1.2: Dimensions of welfare in Chapter 6 to Chapter 8

Chapter	6	7	8
Poverty			
Income	■	■	■
Poverty headcount	■	■	■
Coping			
Employment	■	■	■
Sales and borrowing	■	■	■
Private Transfers	■	■	■
Health service			
Medication	■	■	■
Check-up	■	■	■
Treatment	■	■	■
Medical insurance		■	■
Vaccination			■
Health behaviour			
Smoking		■	■
Drinking		■	■
Walking		■	■
Breast-feeding			■
Health outcomes			
Functional limitations	■	■	■
Chest pain	■	■	■
Mortality	■	■	■
Cognitive functions	■	■	■
Self-rated health	■	■	■
Stunting and wasting	■	■	■
Sickness	■	■	■
Nutrition			
Nutrients	■	■	■
Vitamins and minerals	■	■	■

pense with the arbitrary assumption of equal allocation. Similarly, contentious measurement issues do not arise, such as adjusting for economies of size and composition and converting nominal into real variables. Looking at a range of welfare measures is also important for data concerns. The reliability of any given welfare indicators can be severely undermined by measurement problems (Deaton 1997). Additional evidence can indicate whether observed changes are real (Baulch and Hoddinott 2000).

1.3 Literature Review

Various papers investigate the trends in poverty and inequality during the 1990s in Russia. One key question is to what extent the rise in poverty is due to lack of income (or consumption) growth or an increase in inequality. Commander et al. (1999) draw on the first seven rounds of the RLMS. Poverty declined from 1992 to 1994 and increased from 1994 to 1996. Russia was marked by high inequality already at the beginning of the 1990s and inequality rose further up to 1996. The authors contribute the rise in inequality to changes in the composition of household income, namely the increase in entrepreneurial, self-employment and capital income at the expense of wage income and public transfers with the exception of pensions, and to a divergence in regional living standards. A decomposition analysis based on Ravallion and Datt (1991) suggests that lack of growth rather than rising inequality accounts for the bulk of the rise in poverty from 1994 to 1996.

Shorrocks and Kolenikov (2001) extend the Commander et al. (1999) analysis in a number of ways. First, they cover the period from 1985, the beginning of the economic reforms under President Gorbatchov, to 1999. Second, to span this 15-year period, they have to rely on a constructed income distribution based on official summary statistics for per capita income, income quintile shares, and poverty lines. Third, since the poverty line was revised various times over this period, they decompose changes in poverty into changes in three factors: mean income, inequality and the poverty line. Fourth, they argue that the results of the Ravallion and Datt (1991) decom-

position method are sensitive to both the choice of the base year and the order in which the factors are considered. As an alternative, they develop a new method of assigning contributions to factors based on the Shapley decomposition rule in cooperative game theory. The results indicate that the change in mean income has the largest quantitative impact on poverty in most years, but the effects cancel out when cumulated over the period from 1985 to 1999. In contrast, the cumulative effect of rising inequality is the principal cause of the high poverty rates experienced in the 1990s. However, the analysis confirms the finding of Commander et al. (1999) that changes in mean income are the main factor in increasing poverty after 1994.

In a companion paper, Kolenikov and Shorrocks (2003) apply the Shapley decomposition to account for the regional dimension of poverty in 1995. In line with Commander et al. (1999), they argue that Russia is marked by large regional differences in economic conditions. For the two-way decomposition, they find that inequality has a greater impact on the poverty rate than real income per capita in about half the regions. However, once real income per capita is separated into nominal income and price components, nominal income differences are the most important factor determining regional poverty.

Lokshin and Ravallion (2000) assess the performance of the social safety net during the 1998 financial crisis on Russia using the RLMS. They find that consumption fell, and more than income, and subjective economic well-being deteriorated. Under the assumption of no behavioural responses, they find that the changes in the public transfers reduced consumption poverty by one percentage point, and income poverty by three percentage points. This reduction in poverty was due to better targeting of the safety net, even though outlays per capita declined by almost one fifth. The changes in the safety net helped to promote previously poor household from poverty, although it did little to protect non-poor households to fall into poverty.

Other papers analyse the changes in the wage distribution during transition. Brainerd (1998b) draws on the 1991, 1993 and 1994 rounds of the cross-section household surveys of the All-Russian Centre for Public Opinion Research. She find that wage inequality has become higher than in the United States and that returns to

skills have increased substantially. In addition, women's wages have declined relative to men's wages, and older workers have suffered sharp relative wage declines. Cheidvasser and Benitez-Silva (2000) use the 1992 to 1998 rounds of the RLMS to estimate the change in the returns to education. They find that the returns to education in Russia are quite low compared with those reported for other countries. In contrast to Brainerd (1998b), the results suggest little sign of increasing returns to education during the period. They interpret this as evidence for a mismatch between demand and supply: white-collar workers are in over-supply whereas blue-collar employees are in high demand. Turunen (2004) investigates the mobility of workers from state employment to either non-state employment or non-employment in the first half of the 1990s. Using the RLMS, he finds that those with university education, with supervisory responsibility and in white-collar occupations are less likely to leave state jobs, suggesting that non-state employment comprises mostly unattractive low skill jobs. These findings are consistent with those by Cheidvasser and Benitez-Silva (2000).

Another theme of the literature is to identify population subgroups most prone to chronic or persistent poverty. The studies develop similar poverty and vulnerability profiles. Using the first seven rounds of the RLMS, Klugman and Braithwaite (1998) argue that poverty is higher for families with children, the unemployed, and elderly people living alone. Commander et al. (1999) confirm that chronic poverty is associated with low educational attainment, being unemployed and living in large families. They also uncover a large degree of vulnerability, with only one third of the households never being poor in at least one round. Spryskov (2000) uses the 1994 to 1998 rounds of the RLMS to estimate a proportional hazard model. He also finds that single mothers with children, elderly living alone and households with unemployed are particularly vulnerable. Gerry and Li (2002) investigate which groups suffered from the largest contraction in consumption during the 1998 financial crisis. Quantile regressions show that vulnerability is associated with low education in urban areas, living in pensioner households and lack of access to home production.

A set of papers look at the relationship between subjective and

objective well-being in Russia. The evidence suggests that objective and subjective measures are broadly consistent. Ravallion and Loshkin (1999) use the 1996 round of the RLMS to examine the determinants of subjective economic welfare. The underlying idea is to rely on individuals themselves to define the level of well-being. Under the assumption that individuals provide comparable responses, they investigate ladder questions where persons are asked to rank themselves on a nine-point scale. Ordered probit regressions show that household income per equivalent adult is positively related to subjective economic welfare. However, other factors, such as expenditure, educational attainment, health status, and employment, are important in addition to income. Drawing on the 1994 to 1996 panel of adults, Ravallion and Lokshin (2002) extend their analysis of subjective economic welfare to control for individual fixed-effects. The results confirm that subjective economic well-being increases with income and decreases with ill-health and unemployment. Ferrer-I-Carbonell and Praag (2001) use a household panel data set RUSSET, organized by the University of Amsterdam, to contrast objective and subjective measures of poverty. They argue that alternative subjective measures show strong consistency and can be reconciled with objective measures. Lokshin and Ravallion (2002) investigate self-rated economic well-being and power in Russia, using the 1998 and 2000 rounds of the RLMS. Ordered probit regressions are estimated to assess to what extent economic welfare and empowerment are related to a common set of covariates. They find that both self-rated power and welfare increase with higher individual and household income, and that the impact of individual income is primarily direct rather through higher household income.

Risk is a pervasive characteristic of life in developing countries and households are exposed to unexpected events affecting economic resources (Morduch 1994, Chaudhuri 2000, Dercon 2001, and Hess et al. 2003). A number of authors investigate the impact of income shocks on welfare measures in Russia. The findings indicate that households are only partly successful in preserving welfare levels through coping strategies.

Some contributions deal specifically with pension and wage arrears. Desai and Idson (1998) draw on the 1994 to 1996 rounds of

the RLMS to look at the wage arrears crisis. They employ cross-sectional probit regressions to assess the impact of non-payment of wages on poverty, income, and subjective well-being. They establish that wage arrears have a detrimental impact on worker households. Foley (2002) looks at pension arrears and coping mechanisms among elderly Russians using the 1994 to 1996 rounds of the RLMS. He finds that pension arrears increase the likelihood of poverty and identifies the reduction of remittances and increase in asset sales as principal coping strategies, while home production appears to have played little role in cushioning the income shock. Gerry and Li (2002) investigate whether households save in anticipation of wage arrears. Using the RLMS round from 1994 to 1998, they construct a balanced sample of household heads employed as working-age civilian. Income risk is defined as a household's probability of suffering from wage arrears one year ahead. They find that savings increase with higher income risk, which they interpret as evidence for a precautionary saving motive. Kolev and Pascal (2002) investigate the determinants of pensioner employment in Russia. Using the RLMS from 1994 to 1999, the analysis confirms that family income and access to alternative coping mechanisms affect the probability of holding a job and the number of hours worked for women. There is little evidence that pension arrears and pension benefits have a bearing on pensioner employment for either men or women. According to Kolev and Pascal (2002), this indicates that pensioners have to rely on supplementing pensions with wages even in the absence of payment arrears as pension levels are so low.

Other authors have turned to alternative sources of income shocks than payment arrears. Stillman (2001) looks at the impact of the macroeconomic crisis of 1998 on household income and consumption. He finds that both household income and non-durable expenditure declined by one quarter to one third. Overall, he concludes that there is an almost one-to-one correspondence between exogenous shocks to income and changes in non-durable expenditures. Stillman and Thomas (2002) use changes in oil prices to identify exogenous shocks to household resources in urban areas. They find that food quantities and energy intake appear to be resilient to variation in income, although diet composition does change in response to transitory in-

come variation.

Studies on developing countries have looked at the differences between covariate and idiosyncratic shocks, following the seminal work by Townsend (1994) on testing for complete risk pooling within villages. While the findings of these studies are mixed, a typical outcome is that full pooling is rejected but that there is evidence for incomplete risk sharing across households (Deaton 1997 and Strauss and Thomas 1995). Skoufias (2003) applies this framework to examine the extent to which households are able to insure their consumption from fluctuations in their real income and specific economic shocks. Drawing on the RLMS from 1994 to 2000, he shows that consumption is only partially protected from idiosyncratic shocks, and food consumption is better protected than non-food consumption. Households complement their self-insurance strategies with informal risk sharing arrangements with households within their community. Mu (2003) extends the framework to investigate whether education affects the consumption smoothing ability of household in Russia. Using the 1995 to 2000 rounds of the RLMS, he confirms that income changes matter to consumption change. Education of household members enhances the consumption smoothing in the high wealth group but not in the low wealth group. This suggests that the ability to deal successfully with economic crises is enhanced by education.

The life expectancy of the Russian population is one of the lowest in Europe. Poor health status is not just a legacy of the Soviet period, but also reflects an unprecedented upswing in morbidity and mortality rates in the early 1990s. A substantial literature has emerged on the causes of the drop in life expectancy during 1991 to 1993, and more generally about the poor health of the Russian population. Explanations point to lifestyle factors, like alcohol abuse, smoking, and poor nutrition, to a deterioration in health services and the sanitation system (Lui et al. 1998), to the slow progress in economic reforms (Brainerd 1998a), and to the unravelling of the social fabric and "transition stress" (Bobak et al. 1998, Kennedy et al. 1998, and Shkolnikov et al. 1998).

1.4 Contribution to Literature

The thesis considers income shocks, occurring in the form of payment arrears of wages and pensions and other government transfers, to explore the nature of the linkages between economic resources and various measures of welfare. The connections run typically in both directions. Lack of income can cause malnutrition and ill health, just as better nutrition and health can boost an individual's earnings ability. The focus of the empirical analysis is on identifying the impact of the lowness of economic resources on the deprivation of individual capabilities. While feed-back effects from poor health to low economic status are a concern for the econometric analysis, the analysis do not provide direct evidence on such reverse causality. The key methodological challenge in the research is to disentangle the impact of a change in household income on consumption, health and other outcomes from the effects of these other factors. The principal contribution of the thesis is twofold. First, the thesis applies modern tools of non-experimental impact evaluation to investigate the welfare impact of payment arrears in Russia during the mid-1990s. Second, the analysis provides an integrated assessment of a range of changes in welfare outcomes as a result of the payment arrears for particular population subgroups. The study covers poverty, coping mechanisms, nutrition, health behaviour, health service utilization, and health outcomes.

The literature shows the poverty and inequality increased during transition while public transfer programs were cut back. Chapter 5 extends the analyses of Commander et al. (1999), Shorrocks and Kolenikov (2001), Kolenikov and Shorrocks (2003) and Lokshin and Ravallion (2000) in four ways. First, rather than assessing the contribution of growth and inequality to poverty trends, it evaluates the impact of changes in public cash programmes on changes in poverty. Russia inherited from Soviet times large-scale cash transfers that were part of the overall anti-poverty strategy. Pensioners and families with children are among the groups identified in the literature as being vulnerable to poverty, and the two most important transfer programmes are pensions and child benefits. Second, the analysis explores in detail the changes in cash transfer entitle-

ments and the incidence of payment arrears of cash transfers. Third, it allows for behavioural responses to changes in cash transfers by estimating propensities to consume from cash transfer components. Using Instrumental Variables estimation, the chapter estimates the propensity to consume from government cash transfers separately for each transfer type and account for the differences in the coefficients. The propensity to consume is higher from permanent than from transitory income sources, and larger for pensions than for child benefits and other income. Fourth, it modifies the Ravallion and Datt (1991) decomposition technique to quantify the contribution of changes in cash transfers to the changes in poverty. The adjustments in cash transfers led unambiguously to a rise in poverty between 1994 and 1998.

The literature suggests that economic shocks, such as payment arrears or the 1998 financial crisis, affect income, consumption, and subjective economic well-being. Households differ in their ability to cope depending on assets, education, and regional characteristics. There is also evidence that the health crisis during the first part of the 1990s was related to the economic downturn. Chapter 6 to 8 build on these findings to explore in detail the economic, nutrition and health impacts of specific income shocks on particular population subgroups during the mid-1990s.

Chapter 6 investigates the impact of pension arrears on pensioner welfare.[3] It differs from Foley (2002) in three ways. First, the chapter focuses on the 1996 pension crisis rather than the overall period from 1994 to 1996. A decline in tax revenues and a break-down of the Pension Fund finances led to a sharp rise in pension arrears from 1995 to 1996. Second, it exploits the panel nature of the RLMS and utilizes a difference-in-difference setting, while Foley (2002) applies cross-sectional regressions. As discussed in Chapter 2, this method is suitable under certain assumptions for identifying the causal effect of pension arrears on the welfare of old-age pensioners. Third, the analysis goes beyond a discussion of the economic impact to cover nutritional and health impacts. Poverty rates doubled and the intakes of calories and protein declined significantly among affected

[3]This chapter is based on a joint paper with Robert Jensen (Jensen and Richter 2002).

pensioners. Male pensioners experienced higher functional limitations and more chest pains, and were more likely to die over the next two years. The health status worsened even though households responded in ways that mitigated the impact of the crisis, replacing one-fifth of lost pension income through increased labour supply and asset sales.

Chapter 7 and Chapter 8 deal with wage arrears. The analysis extends the work by Desai and Idson (1998) in four dimensions. First, the treatment variable is defined at the level of households rather than individuals. Instead of focusing on the well-being of workers themselves, the chapters look at the welfare impact of groups living together with workers. Chapter 7 investigates the impact of wage arrears on the elderly who are either working themselves or living together with workers. Chapter 8 studies the impact of wage arrears on children in worker households. Second, the analysis employs cross-sectional and difference-in-differences matching estimation rather than cross-sectional regression analysis. As explained in Chapter 2, matching allows for heterogeneity in treatment impacts and ensures that arrears households are compared only to observationally similar non-arrears households over the common support. Third, the discussion covers a broader range of outcome variables, including health behaviour, health service utilization, objective and subjective health outcomes and nutrition. The results of Chapter 7 show that wage arrears had a detrimental and significant impact on old age welfare, including current and future health, over a wide range of control variables and sample restrictions. Similar to the findings on pension arrears, the effect was larger on men than on women. Arrears households compensated about 10 to 14 percent of the wage loss from other income sources. I exploit the rich data set to rule out alternative channels, including health services, environmental conditions, alcohol and cigarette consumption, and other economic circumstances. The findings of Chapter 8 suggest that wage arrears had a large negative impact on economic well-being, nutrition and the growth status of children in households with wage arrears. As in the previous chapters, these families were only partially successful in replacing the wage reduction with alternative revenues.

Chapter 2

Methodology

2.1 Introduction

A broad distinction can be made between two types of empirical research in economics: descriptive analysis and causal inference. In general, they are not competing but complimentary methods. This thesis contains examples of both descriptive and causal research. Descriptive analysis can help to establish facts about household welfare that need to be explained by theoretical reasoning. Much of the motivation for my research is based directly on findings from descriptive analysis. For example, the macroeconomic context of Russia's non-payment crisis in the mid-1990s is summarized in Chapter 4, which draws on public expenditure and revenue data to emphasize the fiscal origins of the explosion in arrears. Chapter 5 unravels the broad features of the trends and incidence of arrears in government cash transfers, presenting both official entitlement levels from official national statistics and actual receipts according to the household survey data. This analysis is essential for understanding the (implicit) allocation rules applied for deciding which pensioner, worker, or mother receives payments in case of funding shortfalls.

In contrast with descriptive analysis, causal inference research seeks to determine the effects of particular interventions or policies, or to estimate features of the behavioural relationships formulated on the basis of economic theory. The principal evaluation problem of the thesis is to estimate the impact of income changes on household

welfare. The literature originated with contributions from Ashenfelter (1978), Ashenfelter and Card (1985), and Heckman and Robb (1985). My research relies heavily on economic models and econometric methods developed for the analysis of the evaluation problems in labour, public and development economics for cross-sectional and longitudinal data. I employ mainly three approaches:

- Instrumental Variables;
- Difference-In-Differences, and
- Matching.

While IV estimation have played an important role in empirical studies for a long time, the applied economic literature using the matching or difference-in-differences approaches originates from the last fifteen years.

Taking the example of non-payment of wages, the researcher is confronted with a missing data problem. At any moment in time, a worker is either receiving or not receiving wages. As a individual cannot be observed in both states at the same time, it is necessary to construct the counterfactual. This chapter introduces these three distinct but related solutions to this issue, in cases where no explicit social experiment with a randomly selected control group was conducted.[1] In contrast to standard cases in the evaluation literature, the wage arrears crisis constitutes a reverse experiment. Rather than identifying the impact of participation in a program (wage payment), the analysis investigates the impact of dropping out of a program (arrears in wage payments).

This chapter presents a reference model, borrowed from Blundell and Dias (2002), and introduces the three main estimators and their applications in Chapter 6 to Chapter 8. The discussion incorporates insights from Blundell and Dias (2002), Heckman et al.

[1]Well-designed social experiments are a convincing solution to the missing data problem, yet this approach can suffer from various limitations. They are expensive to conduct, cannot easily be extrapolated to evaluate modified policy proposals, and require the control group to be completely unaffected by the policy, both directly and through general equilibrium effects.

(1997), Heckman et al. (1997), Heckman et al. (1998), Blundell et al. (2001), Jalan and Ravallion (2003), Ravallion (2003) and ?). Section 2.6 turns to an overview of evaluations of non-experimental estimators compared to experimental estimators, with a particular focus on matching estimators. The final section draws lessons for the empirical applications in Part II of the thesis.

2.2 Model

Before I present the three methods, it is useful to lay out a model as a reference point. The basic setup is in the form of an endogenous selection model.[2] Suppose households experience payment arrears at time k, and the objective is to identify the impact on some outcome variable, say health status H, such as caloric intake, child stunting rates or old-age mortality of household members. H depends on exogenous variables, X, and this relationship differs for arrears and non-arrears households. Let A be a dummy variable indicating the arrears status ($A = 1$ if arrears and $A = 0$ if no arrears). Using superscripts 0 or 1 to identify treatment status and subscripts i and t to represent, respectively, household (or individual) and time period, the outcome equations at $t > k$ become:

$$H_{it}^1 = g_t^1(X_i) + U_{it}^1 \tag{2.1}$$

$$H_{it}^0 = g_t^0(X_i) + U_{it}^0 \tag{2.2}$$

which can be combined to:

$$H_{it} = A_{it}H_{it}^1 + (1 - A_{it})H_{it}^0 = g_t^0(X_i) + \alpha_{it}(X_i)A_{it} + U_{it}^0 \tag{2.3}$$

where

$$\alpha_{it}(X_i) = H_{it}^1 - H_{it}^0 = [g_t^1(X_i) - g_t^0(X_i)] + [U_{it}^1 - U_{it}^0] \tag{2.4}$$

[2]The model is based on Blundell and Dias (2002).

is the household specific treatment effect, the functions g^0 and g^1 relate regressors X to outcomes (H^0, H^1), and the error terms (U^0, U^1) are of mean zero and uncorrelated to observables X, which represent characteristics of the household and its members and other relevant factors, such as community variables. The variables X are exogenous as they should not be affected by treatment or pre-determined at the time of the treatment. Equation 2.3 highlights that arrears status A_{it} is assumed to have a direct impact on the welfare measure. The treatment effect varies across households even conditional on X_{it} due to the impact of the unobservables.

The assignment of households into arrears and non-arrears categories depends on observable characteristics W and a mean zero error term V, such that

$$S_i = f(W_i) + V_i \tag{2.5}$$

and a household is part of the arrears group when S is positive:

$$A_{it} = 1 \text{ if } S_i > 0 \text{ and } t > k$$

$$A_{it} = 0 \text{ otherwise.} \tag{2.6}$$

In the simplest case, the arrears impact is unrelated to the observable or unobservable characteristics of the household. Such homogeneous treatment effect is represented by an intercept shift in g:

$$\alpha_t = \alpha_{it}(X_i) = g_t^1(X_i) - g_t^0(X_i) \text{ with } t > k \text{ for any } i. \tag{2.7}$$

Equation 2.3 becomes

$$H_{it} = g_t^0(X_i) + \alpha_t A_{it} + U_{it}, \tag{2.8}$$

as the arrears status does not affect the error terms and the arrears outcome differs from the non-arrears outcome by a constant. The assumption of homogeneity has another important implication. Since the treatment impact is not related to X, it can be extrapolated outside the range of household characteristics X represented by

both arrears and non-arrears groups, i.e. outside the area of common support of X.

However, the homogeneity assumption is unlikely to hold in most cases. For example, the effect of wage arrears on household welfare may vary depending on demographic composition, wealth, or skill levels. Consequently, treatment effects depend on household characteristics and population subgroups and different definitions of treatment effects have to distinguished. In particular, the mean treatment on the treated effect at $t > k$ is given by

$$\alpha_T = E(\alpha_{it}|X = X_i, A_t = 1).$$

where α_T is the impact of arrears on households of type i among those who are assigned to arrears. It is the most common parameter of interest in the recent literature on non-experimental evaluation of heterogeneous treatment impacts.[3]

Under this more general setting where the treatment impact depends on household characteristics, the assignment to arrears status is most likely not random. For example, wage arrears may affect workers with low productivity more often than workers with high productivity. At the same time, workers with low productivity level might have worse health than workers with high productivity level. If productivity levels of workers are unobserved, then treatment status A and the error terms of the outcome equation (U^0, U^1) will be correlated.

Such a selection on unobservables implies that the OLS estimator is inconsistent. In particular, Equation 2.3 can be rewritten as

$$H_{it} = g_t^0(X_i) + \alpha_t(X_i)A_{it} + [U_{it}^0 + A_{it}(U_t^1 - U_t^0)]$$

where

$$\alpha_t(X_i) = E[\alpha_t(X_i)] = g_i^1(X_i) - g_i^0(X_i)$$

is the expected treatment effect at time t among worker households characterized by X_i. In general, the OLS estimator fails to identify this parameter as

[3]If the outcome of interest is earnings, a comparison of α_T with the mean programme costs per participants indicates whether the programme's economic benefits outweigh its costs.

$$E\left[\widehat{\alpha}_t(X)\right] = \alpha_t(X) + E\left[U_t^1|X, A_t = 1\right] - E\left[U_t^0|X, A_t = 0\right]$$

which is different to $\alpha_t(X)$ for selection on unobservables as

$$E\left[U_t^1|X, A_t = 1\right] \neq E\left[U_t^0|X, A_t = 0\right].$$

The following sections will introduce three alternative methods for consistent estimation of the treatment impact.

2.3 Instrumental Variables Method

The standard econometric approach to endogeneity is the use of instrumental variables (IV). In the simple linear model with homogeneous treatment effects, the IV estimator removes all the biases resulting from the non-randomised control under an exclusion restriction.[4] Instrumental variables Z have to be excluded from the outcome equation but included in the selection equation. They are a source of exogenous variation linked only to arrears status but not to the outcome directly. Two conditions have to hold:[5]

1. Conditional on X, Z is not correlated with the error terms V, U^0, and U^1.

2. Conditional on X, the selection rule is a non-constant function of Z.

The second assumption implies that Z affects A, so that in general

$$E(A|X, Z) = P(A = 1|X, Z) \neq P(A = 1|X).$$

The first assumption ensures that Z influences the outcome only through A rather than also through unobservables. Under these two

[4]The instrumental variable method can also be used to estimate heterogeneous treatment effects under more stringent assumptions than those presented here (Blundell and Dias 2002 and Imbens and Angrist 1994).

[5]The instrumental variable estimator requires only one time period, so subscripts are suppressed.

assumptions, the IV estimator identifies the treatment effect α by using only that part of the variation in A that is associated with Z:

$$\alpha_{IV} = \text{Cov}(H_i, Z_i)/\text{Cov}(A_i, Z_i).$$

The main difficulty in IV estimation lies in identifying appropriate instruments Z, as they are not supposed to affect the outcome directly yet determine the selection.

The IV approach is applied in Chapter 5 (Table 1.1). The objective of this chapter is to estimate the propensities to consume from cash transfers taking into account consumption smoothing. Following previous studies on estimating the propensity to consume (Case and Deaton 1998, Ravallion, van de Walle, and Gautam 1995, and van de Walle 2001), cash transfers are instrumented to address concerns over endogeneity and measurement error. In the terminology of the model outlined above, the outcome variable H is consumption, the treatment variable A is cash transfers, and the instruments Z are variables that control for the incidence of payment arrears and proxy for benefit rules. IV estimation is more suitable than DID or matching estimation for this setting. The focus is to explore the link from cash transfers to consumption among household eligible for cash transfers. With cash transfer being a continuous variable, the population of interest cannot be easily divided into treatment and control groups. While arrears in cash transfers were widespread during some years, they were relatively insignificant during other years. Instead of contrasting consumption levels of eligible households between those with and without cash transfers, the IV estimation uses determinants of the incidence of cash benefit arrears as instrumental variables for the amount of cash benefits. Cash benefits also differ as a result of entitlement rules, which provide an alternative set of instruments used in the analysis.

2.4 Difference-In-Differences Method

The Difference-In-Differences (DID) method relies on comparing outcomes for groups exposed to a policy change to those of a control group that proxies the features of comparison groups used in social

experiments. This approach, which is sometimes also referred to as natural experiment, has important advantages to the IV estimator. It does not require any exclusion restrictions or any modelling of the selection equation, and even the outcome equation does not have to be specified as long as the treatment impact enters additively. However, it relies on stringent data requirements and strong restrictions on the specification of the error terms and common trends.

The DID estimator relies on longitudinal data or repeated cross-sections as it involves taking double-differences of the outcome variable. The change in the outcome of the treatment group before and after the policy intervention is compared to the corresponding change in the outcome for the control group. From Equation 2.3, H_{it} can be rewritten as follows:

$$H_{it} = g_t^0(X_i) + \alpha_{it}(X_i)A_{it} + \underbrace{(\varphi_i + \theta_t + \varepsilon_{it})}_{U_{it}^0}, \tag{2.9}$$

which decomposes the error term U_{it}^0 into three components: an individual-specific (or household-specific) fixed effect φ_i, a common macroeconomic effect θ_t and a temporary individual-specific effect ε_{it}. Under the identifying assumption

$$E(U_{it}^0|X_i, A_i) = E(\varphi_i|X_i, A_i) + \theta_t \tag{2.10}$$

the selection into arrears status is independent of the temporary individual-specific effect ε_{it}.

This DID estimator eliminates φ_i and θ_t through differencing twice, or "double-differencing":

$$\hat{\alpha}_{DID}(X) = \left[\overline{H}_{t_1}^1(X) - \overline{H}_{t_0}^1(X)\right] - \left[\overline{H}_{t_1}^0(X) - \overline{H}_{t_0}^0(X)\right] \tag{2.11}$$

where $\overline{H}$ represents the mean outcome for the considered subgroup, and $t_1 > k > t_0$. Differencing between t_1 and t_0 for treatment and control group cancels out φ_i, while subtracting the change of the control group from the change of the treatment group eliminates

θ_t. Given Assumption 2.10, it recovers the average effect of the treatment on the treated households since

$$E(\hat{\alpha}_{DID}(X)) = E(\hat{\alpha}_i(X)|A_i = 1) = \alpha_T(X).$$

Assumption 2.10 suggests that there are two essential issues for DID estimation. First, if the assignment A to arrears and non-arrears group is linked to the unobserved temporary individual-specific component ε_{it}, then DID estimation is inconsistent, yielding

$$E(\hat{\alpha}_{DID}(X)) = \alpha_T(X) + E(\varepsilon_{it_1} - \varepsilon_{it_0}|A_i = 1) - E(\varepsilon_{it_1} - \varepsilon_{it_0}|A_i = 0).$$

For example, suppose workers are less likely to receive a wage if they suffered a recent temporary deterioration in health status. The worsening in health outcome attributed to wage arrears might then be overstated.[6]

In addition, the two groups may be exposed to differential changes in the macro environment, or react differentially to the same macro trend. For example, households experiencing non-payment of wages could also face a worsening in public health services, as enterprises run up both wage and tax arrears. The DID estimation would then attribute all the deterioration in workers' health status of the treatment group to wage arrears, even though some of it may be the result of a reduced provision of public health care.[7]

Chapter 6 applies DID estimation to study the impact of the pension arrears crisis of 1996 (Table 1.1). A sudden collapse of the pension system implied that about 30 percent of the pensioners had to make ends meet without pension receipts. This natural experiment is well-suited for the DID method, which relies on comparing outcomes for groups exposed to a policy change (move from payment to non-payment of pensions between 1995 to 1996) to those of a control group not affected by that change (pensions paid both in 1995

[6]This example is analoguous to the so-called Ashenfelter's dip for job training programmes. Enrolment in such programmes is more likely if a temporary dip in earning occurs just before the programme is launched (Ashenfelter 1978). See also Section 2.6.

[7]Bell, Blundell, and Reenen (1999) develop a modified DID estimator that is adjusted for differential trend components. It requires at least three survey rounds.

and 1996). Since the focus is on a homogeneous population subgroup (old-age pensioners), the analysis relies on a linear DID estimator, which simplifies Equation 2.9 to

$$H_{it} = \gamma' X_i + \alpha A_{it} + \underbrace{(\varphi_i + \theta_t + \varepsilon_{it})}_{U_{1t}}.$$

The identification strategy relies on two sources of variation in the incidence of pension arrears. The decentralized structure of the pension system implied that nearly all pensioners in wealthier regions continued to be paid, while between one third to one half of pensioners in debtor regions experienced arrears. Debtor regions also created programme rules which established priorities for which pensioners should be paid in the event of revenue shortfall.

2.5 Matching Method

The matching method assumes that households with similar characteristics respond in the same way to policy interventions. Treated households are paired with non-treated households on the basis of observable features, so that the only remaining difference between the two groups is the arrears status. Like the DID method, the matching estimator is based on comparing outcomes for treatment and control groups. It also does not require any exclusion restrictions or specification of selection and outcome equations. In contrast to DID, matching does not rely on the additive specification of the error term. Most importantly, the non-parametric method is not plagued by two important sources of evaluation bias for parametric approaches: mismatching and misweighing.

To be more specific, the matching estimator is based on two key assumptions. The conditional independence assumption (CIA) requires that[8]

$$H^0 \perp A \mid X. \tag{2.12}$$

[8]The conditional independence assumption is sometimes referred to as unconfoundedness assumption (Ichino 2002).

Controlling for X, non-arrears outcome H^0 is independent of assignment status A. Intuitively, this assumption ensures that, conditioning on observable covariates, assignment to treatment is random and unobservables play no role in the selection. In particular, it excludes that households may be selected according to the impact of arrears.

The critical issue is whether the right matching variables are considered, as otherwise the counterfactual, the outcome under non-selection of the arrears group, is not recovered. It is also important to limit the set of X variables to those that are not influenced by arrears. Otherwise, the matching estimator will not capture changes in the distribution of the X variables as a result of the programme and therefore not identify correctly the programme impact.

The following decomposition underlines the importance of CIA. The average treatment effect on the treated can be rewritten as

$$\begin{aligned} E(H^1 - H^0|X, A=1) &= E(H^1|X, A=1) - E(H^0|X, A=1) \\ &= \underbrace{E(H^1|X, A=1) - E(H^0|X, A=0)}_{\alpha_T} \\ &\quad + \underbrace{E(H^0|X, A=1) - E(H^0|X, A=0)}_{BIAS} \end{aligned}$$

where the first term is the average treatment effect on the treated and the second term is the bias. Given Assumption 2.12, conditional on observables X, the selection is independent of unobservables and the bias is equal to zero. By matching arrears households with non-arrears households such that the X realizations are replicated, the counterfactual non-treated outcome for the arrears group is identified.

A second assumption ensures that this counterfactual exists for X. The observable characteristics X of the non-arrears group cover the same range as those of the arrears group:

$$0 < P(A=1|X) < 1. \tag{2.13}$$

This condition ensures that both arrears and non-arrears observations exist for each X. Denote this common support of treatment

and control groups by C^*. While Assumption 2.13 ensures that the regressors of the two groups share the same support, Assumption 2.12 guarantees the absence of selection bias at common values of the regressors for both groups. Given these two assumptions, a consistent estimator for α_T is given by the empirical counterpart of:

$$\frac{\int_{C^*} E\left[H^1 - H^0 | X, A = 1\right] dF(X|A = 1)}{\int_{C^*} dF(X|A = 1)}. \tag{2.14}$$

It equals to the expected impact of arrears among the subset of sampled worker households for whom comparable non-arrears worker households can be found. The expected gains are rescaled by the population in the common support C^*.

2.5.1 Propensity Score Matching

The main difficulty in implementing this estimator lies in ensuring matching over the relevant set of observables X. In particular, the more information is used for matching, the higher the dimensionality of X and the smaller the common support C^*. For example, one could stratify the data into bins, each defined by a particular value of X. Within each bin, this amounts to conditioning on X. Assuming there are k relevant binary X variables, the number of cells equals 2^k. The number of cells increases further if some variables in X take more than 2 values or are continous.

In such circumstances, propensity scores can be used to reduce the matching problem from a multi-dimensional to a one-dimensional problem. Let $P(X_i) = P(A_i = 1|X)$ represent the likelihood of arrears status. As shown by Rosenbaum and Rubin (1983), CIA still holds if one controls for $P(X)$ rather than X, and Assumption 2.12 is modified as follows:

$$H^0 \perp A \mid P(X). \tag{2.15}$$

Given this property of the propensity score, it is possible to match arrears and non-arrears observations on the basis of a mono-dimensional variable, the propensity score, instead of the multidimensional vector of observables X. The advantage of using the

propensity score is simplicity, as it allows estimation in two stages. The first stage is to calculate the predicted values from standard logit or probit models to estimate the propensity score for each household. Once estimated, $P(X)$ can be used to define the comparison group for each treated household, based on some distance measure. The selected set of non-treated observations are then weighted according to a specific scheme, ranging from nearest neighbour (unity weight for closest observation and zero for the others) to kernel weights (observations are weighted relative to the distance to the treated household). The matching estimator can then be calculated in general form as follows:

$$\widehat{\alpha}_M = \sum_{\{i:A=1\}} \left\{ H_i - \sum_{\{j:A=0\}} W_{ij} H_j \right\} w_i \tag{2.16}$$

where W_{ij} is the weight associated with each comparison observation j for household i and w_i represents the re-weighting to reconstruct the outcome distribution for the treated sample.

Chapter 7 and Chapter 8 employ matching estimation to investigate the impact of wage arrears on children and elderly during 1994 to 1998 (Table 1.1). In contrast to pensions, the non-payment of wages affected a significant proportion of the labour force throughout the entire period, and relatively few households change wage arrears status from one round to the next. The estimation relies primarily on cross-sectional matching techniques which compare households with wage arrears to suitable comparison households without wage arrears. Similar to Chapter 6, the estimation strategy exploits both inter-regional and intra-regional differences in wage arrears incidence to construct treatment and comparison groups. The matching procedures ensure that arrears and non-arrears households are placed in a common economic and geographic environment.

2.5.2 Difference-In-Differences Matching

Matching and DID can be combined to obtain the double-difference matching estimator. This assumes the specific structure of the error terms of Equation 2.9. As in the case of DID, this method allows for selection into arrears status related to household-specific fixed effects

and for common trends between treatment and control groups. The identifying assumption is that the matched control group evolves from pre- to post-treatment period in the same way as the treatment group would have done in the absence of arrears.[9] CIA of Equation 2.12 or 2.15 becomes:

$$(\epsilon_{t_1} - \epsilon_{t_0}) \perp A \mid P(X) \tag{2.17}$$

where $t_1 > k > t_0$. Modifying Equation 2.16, the average treatment effect on the treated α_T is estimated as follows:

$$\widehat{\alpha}_{MD} = \sum_{\{i:A=1\}} \left\{ [H_{it_1} - H_{it_0}] - \sum_{\{j:A=0\}} W_{ij} [H_{jt_1} - H_{jt_0}] \right\} w_i. \tag{2.18}$$

The evidence presented in Section 2.6 suggests that the difference-in-difference matching (DIDM) estimator outperforms the matching estimator in many applications. Chapters 7 and 8 use DIDM to verify results from cross-sectional matching. The DIDM estimation is based on one fifth to one third of the impact estimates for cross-sectional matching.

2.6 Evaluations of Estimators

A number of authors have assessed the reliability of the techniques described in the previous sections using experimental data based on random selection. Estimates from non-experimental approaches are compared to those from experimental design.[10] This section summarizes some of these contributions.

[9]The approach requires longitudinal data. A corresponding estimator for repeated cross-sections can be designed by matching each household after treatment three times (to the treatment group before treatment, and the control group before and after treatment).

[10]Heckman and Smith (1998) conduct a fully controlled experiment with simulated data. The authors construct a structural model of an individual's participation and earnings decisions to investigate the biases of different methods under alternative underlying hypotheses. Three estimators (cross-sectional differences, DID, and IV) are compared for alternative assumptions regarding the nature of the effect (homogeneous versus heterogeneous), the amount of information available to the individual, and the magnitude of variability of the individual

LaLonde (1986) was the original methodological study on the impact of labour market programmes for disadvantaged workers on earnings. He uses data from the National Supported Work Demonstration (NSW), a labour market programme in which participants were randomised between treatment and control groups. For two population subgroups (women in receipt of aid for families with dependent children and disadvantaged men), the study compares the coefficients from an experimental design to parameter estimates of traditional non-experimental techniques (cross-section regression, before-after, and DID methods) where the control groups are drawn from alternative data sources, namely the Panel Study of Income Dynamics (PSID) and the Current Population Survey (CPS).[11] The paper finds that the non-experimental approaches significantly change the results. Alternative estimators produce very different coefficients and specification tests provide little help in choosing among competing estimators. LaLonde (1986) concludes that non-experimental methods are not reliable in evaluating programmes.

The LaLonde (1986) analysis was first criticized by Heckman and Hotz (1989). They propose a wider range of specification tests to sort among non-experimental estimators and find that such tests rule out estimators that yield substantially different treatment impacts than those from experimental design. The tests are primarily based on pre-programme data, so their validity depends on the similarity of the selection and outcome models in pre- and post-programme time periods.

Heckman et al. (1997) and Heckman et al. (1998) extend the criticism of the LaLonde (1986) study beyond the issue of specification

fixed-effect. Under either homogeneity of impacts, or heterogeneity together with allowing individuals to know only about the expected gains rather than individual gains from the programme before the treatment, the cross-sectional estimator is downward biased, DID has a substantially smaller bias as it controls for fixed effects, and IV gives consistent estimates. In case of heterogeneity and perfect foresight, the performance of the cross-sectional and especially DID estimators improve, as selection depends now largely on α_1, while IV produces less satisfactory results.

[11] More specifically, LaLonde (1986) compares the programme impact estimated experimentally to that estimated non-experimentally. The difference constitutes the evaluation (or selection) bias.

tests. First, the data for treatment and control groups comes from different questionnaires, resulting in different measurements of the outcome variable. Second, the data is not sufficiently rich to distinguish clearly among different types of workers, leading to a failure to account adequately for heterogeneity. Third, the control groups are not taken from the same local labour market, implying that participants and control differ in key observables prior to the programme.[12] To illustrate the last point, compared to the NSW group, the PSID and CPS sample units are on average 8 to 9 years older, have different ethnic composition, have mostly completed high school degrees rather than dropped out of high school, and have much higher pretreatment earnings. Separating four different demographic groups (male and female adults; male and female youth), they decompose the evaluation bias from using a non-experimental control group into three components:[13] (a) selection on unobservables, (b) failure to

[12]Blundell, Dias, Meghir, and Reenen (2001) show that different comparison groups can play an important role in understanding the impact of labour market programmes. They investigate the introduction of the British 'New Deal for the Young Unemployed' policy, a manadatory job search assistance programme combined with various subsidized options including wage subsidies to employers, temporary government jobs and full time education and training. The study evaluates the effectiveness of the scheme by exploiting design features to construct two comparison groups: individuals who are slightly too old for eligibility but otherwise similar characteristics than eligible unemployed; and individuals who satifies the eligibility criteria but who live outside of participating areas during the pilot phase prior to the national roll-out. The second comparison group also provides insights into possible general equlibrium effects of the programme, including substitution effects (participants get job that non-participants would have received in absence of the programme) and equilibrium wage effects (programme is large enough to affect overall wage levels by changing labor supply). The results of the analysis suggest that the outflow rate from unemployment for men increased by about 20 percent as a result of the new policy. This suggests that the substitution and wage effects are either not important or cancel each other out. Other evaluations of labour market programmes are presented in a special edition of Labour Economics (Smith 2002).

[13]Heckman et al. (1997) and Heckman et al. (1998) define the evaluation bias slightly differently than LaLonde (1986) (see Footnote 11). They compare the randomized-out controls to non-participants. Since both groups do not take part in the programme, a consistent non-experimantal estimator applied to the controls combined with the non-participants should produce an estimated impact equal to zero (Smith and Todd 2004a).

compare treatment and control groups at common values of matching variables, and (c) failure to weight the two groups comparably. They find that differences in unobservables play only a small role in accounting for evaluation bias, while failure to locate participants and comparison group members in the same labour market, to include data on recent labour market histories, and to reweigh control observations appropriately are majors sources of evaluation bias. In addition, Heckman et al. (1997), Heckman et al. (1998) and Heckman et al. (1998) introduce kernel and local linear matching estimators that use multiple control observations for constructing the counterfactual outcome for each treatment observation and propose DID versions of matching estimators. Compared to matching, DIDM leads to a reduction in the evaluation bias for three out of the four demographic subgroups, and leaves it approximately unchanged for the fourth one. Heckman et al. (1998) also argue that the matching estimators performed best when a rich set of conditioning variables is used.[14] The evaluation bias becomes larger when matching is based on only a crude set of variables.

Dehejia and Wahba (2002) and Dehejia and Wahba (1999) provide an alternative criticism of LaLonde (1986). Drawing on the same data sources as LaLonde (1986), they evaluate the performance of propensity score matching methods in non-experimental settings. They motivate their study by arguing that the dimensionality of the observable characteristics is typically high and data on the outcome variable for the control group costly to obtain. In particular, they argue that an evaluation of NSW programme has to take into account two features. First, it requires comparing treatment and comparison units across a large set of pre-treatment characteristics. Second, for some observations in the treatment group, the non-comparison group contains only few comparable units. For this setting, the authors propose propensity score matching with replacement: many treated units are allowed to be matched to the same control unit. They find that cross-section propensity score matching, implemented as nearest neighbour or caliper matching, succeeds in producing accurate estimates of the treatment impact. Their analysis confirms the

[14]This is supported by Lechner (2002) and Jalan and Ravallion (2003).

importance of checking the comparability of the treatment and control units in terms of pre-treatment characteristics and of discarding unmatched comparison units.

Smith and Todd (2004a) reexamine the LaLonde (1986) results in light of the findings of the studies by Heckman et al. (1997), Heckman et al. (1998), Heckman et al. (1998), Dehejia and Wahba (2002) and Dehejia and Wahba (1999). They argue that the good performance of propensity score matching in Dehejia and Wahba (2002) and Dehejia and Wahba (1999) is surprising given the lesson learnt from Heckman et al. (1997), Heckman et al. (1998) and Heckman et al. (1998). Smith and Todd (2004a) show that the performance of cross-sectional matching estimators is highly sensitive to the choice of the subsample from the NSW data. In particular, 40 percent of the observations used in LaLonde (1986), containing mostly high earners, are excluded in the Dehejia and Wahba (2002) and Dehejia and Wahba (1999) papers. Smith and Todd (2004a) show that the cross-sectional matching estimators perform worse once this data is included in the analysis. Further, they find that DID matching estimators exhibit lower biases than cross-sectional estimators, as they wipe out temporally invariant differences in outcomes between participants and non-participants. These differences could be arising from geographic mismatch and alternative measurements of the dependent variables. Finally, Smith and Todd (2004a) find that the details of the matching procedure related to the specific weighting scheme or the choice of bandwidth, have little impact on the estimated bias for the NSW data. However, the imposition of the common support condition is important in some cases.

In a reply to Smith and Todd (2004a), Dehejia (2004) emphasizes three issues. First, the conclusions in Smith and Todd (2004a) regarding the reliability of the cross-sectional matching estimators are based on applying the specification developed for the Dehejia and Wahba sample to alternative samples. As a result, a number of pre-treatment covariates are no longer balanced and therefore the cross-section matching estimators are no longer reliable. By contrast, if the propensity score estimator is based on a specification specific to each treatment group-control group combination, the propensity score method fares well. Second, Dehejia (2004) argues that the De-

hejia and Wahba sample produces more reliable and robust estimates than the alternative samples, as the treatment impacts are less sensitive to alternative specifications of the propensity score. Finally, Dehejia (2004) accounts for the selection of the Dehejia and Wahba sample. It includes only those observations with data on at least two years of pre-treatment earnings, in line with the emphasis of the training programme literature to account for the recent earnings history of participants and non-participants (Ashenfelter 1978).

In a rejoinder to Dehejia (2004), Smith and Todd (2004b) point out that the Dehejia and Wahba (2002) and Dehejia and Wahba (1999) findings are based on a small sample. As a result, the conclusions about the nearest neighbour bias estimates are quite sensitive to specific choices in the estimation of the propensity score model, the definition of the bias and how ties are broken in single nearest neighbour matching.

Diaz and Handa (2004) apply the techniques of Heckman et al. (1997), Heckman et al. (1998) and Smith and Todd (2004a) to evaluate the reliability of propensity score matching outside the US and beyond employment programmes. They draw on experimental data from a Mexican anti-poverty programme ("PROGRESA") which in its first phase provided conditional cash transfers to poor rural households. The experimental control group is compared to a non-experimental group of non-participants selected from a nationally representative household survey. Diaz and Handa (2004) show that simple cross-sectional matching displays a low bias for outcomes that are measured using similar survey instruments, such as children's schooling outcomes, and a large bias for outcomes that are measured differently by different survey instruments, such as household expenditure levels and household composition.

2.7 Lessons

The literature on non-experimental impact evaluation techniques highlights a number of important messages for empirical applications of such estimators. First, estimators differ in their identifying assumptions, and the assumptions underlying a given estimator will

sometimes hold in the data and sometimes fail. There is no general solution to the evaluation problem. Hence, the methods have to be carefully applied and cautiously interpreted. Second, data quality is a crucial ingredient to any reliable estimation strategy. Gathering information from programme participants and non-participants in a similar way and in controlling for observed characteristics, including local economic conditions, are important for accurate impact estimates. Finally, the analyses document the importance of discarding unmatched comparison units, weighing treatment observations appropriately and ensuring comparability of the treatment and control units in terms of pre-treatment characteristics.

The estimation procedures used in Chapter 5 to Chapter 8 apply lessons from these studies. First, as explained in Section 2.3 to Section 2.5, the methods are selected in relation to the specific evaluation problem of each chapter. Key results are checked for their sensitivity to alternative estimation procedures. Second, the RLMS provides a high quality data set. The same surveys are used for arrears and non-arrears households, so that relevant variables are measured in an analogous way. In Chapter 6 to Chapter 8, arrears and non-arrears households are grouped with regard to geographic and regional-level variables, ensuring that they come from a similar economic setting. A rich set of variables is used to derive the probability of incurring arrears and to characterize welfare outcomes. Finally, Chapter 7 and Chapter 8 ensure that treatment estimates are estimated strictly over the area of the common support only. Sampling weights are known and applied in the calculation of treatment impacts, ensuring that misweighing is excluded as a source of bias. Chapter 7 employs a balancing test, confirming a close matching of treatment and control units.

Chapter 3

Data

3.1 Introduction

The core of the empirical analysis draws on the Russian Longitudinal Monitoring Survey (RLMS).[1] This chapter presents this data set, introduces complementary data sources and explains the derivation of basic monetary measures of welfare (income, expenditure and poverty).

3.2 Household Survey

The RLMS is a repeated cross-sectional household survey with a large panel component. It was designed to measure the effects of the sweeping changes in Russia since the early 1990s on the economic well-being of households and individuals. The project was started in 1992 with the aim to create the first national sampling frame for Russia. By now, ten rounds of data on individual health status, dietary intake, and labour supply, on household expenditures, incomes, and assets, and on community infrastructure and prices have been collected. The survey is organised and coordinated by the Carolina Population Centre at the University of North Carolina at Chapel Hill.

[1] Information on the RLMS is available on the web (http://www.cpc.unc.edu/rlms).

3.2.1 Sampling

Various factors complicate the drawing of a nationally-representative sample. Russia covers a vast territory of around one tenth of the world land mass with eleven time zones. The regions vary widely in terms of ethnicity of the population, urbanisation, degree of industrialisation etc. In the early 1990s, Russia had no own tradition of conducting surveys, as Goskomstat, the National Statistical Office, had relied during Soviet times on micro-censuses to monitor living standards of the population. The RLMS was collected over two phases, covering 1992 to 1994 and 1994 to 2002, respectively.[2] The objective of the first phase included capacity building at Goskomstat for modern survey techniques. Starting with Round 5, which was collected during autumn 1994, the RLMS began to work together with other Russian institutions, as the emphasis shifted to providing timely information on policy-relevant issues. A new sample was selected using complex survey design, resulting in a leaner and more representative survey instrument. Even though the number of households declined from around 6000 in the first phase to around 4000 in the second phase, the sampling error was likely to be lower due to an increase in the number of Primary Sampling Units (PSUs).

The thesis analyses data of Round 5 to Round 8 (1994 to 1998) from the second phase of the RLMS.[3] The sample for this phase involved a multi-stage design. Starting from a list of 2029 consolidated districts, 38 strata were defined using geographical factors and the level of urbanisation. Moscow, St. Petersburg, and Moscow Oblast were selected as self-representing strata. The remaining districts were allocated to 35 equal-sized strata, and one district was selected from each strata based on 'probability proportional to size' (PPS). Within each selected PSU the population was separated into urban and rural substrata, and the target sample size was allocated proportionately to the two subsample. In rural areas, a list of all villages was compiled to serve as secondary sampling units (SSUs). In urban areas, SSUs were defined by the boundaries of the 1989

[2]Further rounds may be collected if funding is forthcoming.

[3]As explained in the next chapter, this period coincided with the non-payment crisis, which is the focus of the empirical work.

census enumeration districts.

A sample of 4718 households was drawn, allowing for a non-response rate of 15 percent given the target of 4000 households. The sampling frame implies that RLMS statistics are typically representative nationally and at the level of eight 'geographical regions' (Metropolitan areas; Northern and North Western; Central and Central Black-Earth; Volga-Vaytski and Volga Basin; North Caucasian; Ural; Western Siberian; and Eastern Siberian and Far Eastern).

Interviewers were required to visit each selected dwelling up to three times to secure interviews. The household questionnaire was administered to the most knowledgeable and willing member of the household. Additional interviews were conducted with as many adults as possible for the adult questionnaires. Adults also provided the information for the children's questionnaires. Interviews with community representatives were conducted to fill in community questionnaires, and interviewers were instructed to provide information on food prices. Reporting periods varied from the last week for parts of the consumption data to one year for some information on subsidiary farming, but consistent estimates for monthly income and expenditures can be constructed.

3.2.2 Panel Component

The RLMS was designed to provide a panel of dwelling units. With the exception of the construction of new housing structures, the renewed contact with a fixed national probability sample of dwelling units is an easy and cost efficient way to ensure national representativeness. The interviewers returned to the same addresses in late 1995, 1996, and 1998. Over 97 percent of all adults in households were covered in separate interviews.

As any panel survey, RLMS has been affected by sample attrition. During the first round of the second phase, about 94 percent of households were still living in the same dwelling, and overall interview completion rates averaged 84 percent. However, rates were generally lower in urban areas, partly due to higher vacancy rates of housing stock. Lower rates were anticipated in Moscow and St. Petersburg at the design stage, and households in these cities were

over-sampled. The combined influence of non-response attrition and change in dwelling unit occupants does not seriously distort the geographic distribution of the sample or its size or household-head characteristics. The nominal representation of households in Moscow and St. Petersburg is declining, and households with a male head aged 18 to 59 may be subject to slightly higher than average attrition.

Overall, the impact of attrition in the second phase does not severely affect the representativeness of the household panel.[4] The RLMS provides sampling weights for nationally representative estimates. The formulae for calculating standard errors of the welfare measures are adjusted for the clustering and stratification in the set-up of the survey design (Howes and Lanjouw 1997).

3.2.3 Regional Information

To take account of regional determinants, I complement information on individuals and households with data on communities and states (or oblasts). The RLMS contains a community section for each of the 157 sites visited for the interviews. It provides information on demographics, housing, transport, the economy, hospital, schools, social offices and prices of 97 food items. Out of the 89 Russian states, 32 are represented in the RLMS. The analysis complements the RLMS with state-level information on fiscal and economic factors and prices from the Russian Ministry of Finance, State Tax Service, the Pension Fund and Goskomstat.

3.3 Welfare Measures

This section focuses on monetary measures that will be used throughout the thesis. As the derivation of monetary measures is substantially more complex than for other indicators and there is no agreement on the best approach, it is useful to lay out the steps for deriving

[4]Comparing welfare statistics for the cross-sections and the panel, there is no evidence that the panel compromises the representativeness of the sample. Heeringa (1997) comes to the same conclusion.

these indicators.[5]

3.3.1 Income and Consumption

The basic choice is between an income and a consumption indicator of well-being. Common practice for most developing countries is to adopt a consumption-based measure. For example, much of the Word Bank's operational work and policy analysis is based on consumption aggregates derived from survey data to measure poverty, analyse changes in welfare over space and time, and assess the distributional impacts of various projects, programs, and policies.[6] Consumption is likely to be a more useful and accurate measure of living standards than income (Deaton 1997). Income, together with assets, measures the potential claims of a person or household, while consumption captures the level of welfare in terms of what living standard individuals actually acquire. From a theoretical point of view, both concepts can be defended as an approximation to utility. More relevant is the issue of the time period over which living standards are to be measured. The main reason for preferring current consumption to income as an indicator of living standards is variability. In Russia of the mid-1990s, households receive incomes often irregularly due to payment arrears, and depend on the vagaries of agricultural in-kind income from subsistence farming on 'datchas', or huts with small private land plots. Households often have some consumption smoothing opportunities through asset accumulation or depletion, and lending and borrowing. Thus, consumption is likely be a better indicator of current consumption than current income, and current consumption is also like to be a better indicator of longer term welfare, since it reveals information about incomes at other points in time.

A separate issue is how to convert the welfare indicator, be it consumption or income, into a measure of individual welfare. Com-

[5]Each chapter introduces separately other welfare measures utilized in the analysis.

[6]The Living Standard Measurement Study (LSMS) Working Paper Series lays out the methodology and gives examples of analysis of household survey based poverty research as conducted by the World Bank (http://www.worldbank.org/lsms).

mon practice is to start off from the assumption that expenditures and incomes be pooled in a household. The RLMS collects expenditures on consumption items only at the household level. Most purchases occur for the household as a whole (e.g. food), and the bulk of food consumption takes place jointly during meals. While most income receipts, like wages and pensions, are recorded by individual, the RLMS contains no information about the intra-household allocation of income resources. Once the measure of household resources is defined, the next step is to account for the differences in size and composition of households (Coulter et al. 1992). In particular, the needs of household members differ, between adults and children. One option is to try use a system of weights, whereby for example, children count as a fraction of an adult in terms of needs, and convert all households into the number of equivalent adults. But, in addition, there are also economies of scale in consumption. Some non-food items (for example, housing to an extent, durable goods) have public goods characters, as their usage by one member of the household does not reduce their value to other household members. Thus, because people can share such goods and services without reducing their welfare, the cost of attaining a given level of welfare may be lower in larger households. In principle, household size based on equivalent adults can be adjusted for economies of scale to get the number of "effective" equivalent adults. However, attempts to estimate the relative costs, or equivalent scales, faced by different types of families have failed to establish a generally accepted methodology (Deaton 1997 and Howes and Lanjouw 1997). Furthermore, due to subsidised prices for household utilities, economies of scale are likely to be small in Russia (Lanjouw, Milanovic, and Paternostro 1998). At various points in the thesis, I follow standard practice and assume that families allocate resources equally among members, and use household total expenditure, or income, in per capita terms as measure for household resources.[7]

[7]The official poverty line accounts for modest economies of scale as discussed further below in this section.

3.3.2 Construction of the Aggregates

Deriving a consumption measure from the information provided by the RLMS involves going through a series of steps, guided both by theoretical and practical considerations. This section describes the procedure adopted to obtain the consumption, income, and poverty measures.

Consumption

Total household consumption is built up from several components. The consumption aggregate is composed of four main types of goods and services: food items, non-food items, consumer durables and housing. For any given household, the shares of these categories depend on a number of factors, including living standards, demographic composition, location and tastes. Consumption includes all reported expenditures on goods and services, and then adds in a value for consumption that does not go through the market, like home produced consumption items or in-kind receipts from employers and donors. For perishable goods, it is mostly safe to assume that a household's consumption is closely tied to their purchases. However, for durable goods, a correction has to be made for the difference between consumption and expenditures. Finally, I convert all components into real terms using a price index which accounts for differences in regions and interview dates.

The consumption measure used in the analysis diverges from the constructed consumption measure of the RLMS. The main differences concern the evaluation of home production, the exclusion of expenditures on taxes and levies and goods given away, the calculation of accrual-based values for durables and housing (rather than expenditure-based as in the constructed measure), and the consideration of regional price variation.

Food items Conceptually, constructing a food consumption aggregate is straightforward, involving the aggregation of the total value of the food consumed during the recall period. Practical difficulties arise for two reasons. First, households receive food from different sources (purchases, home-production, gifts or remittances, in-kind

payments), and all of them should be included to obtain an aggregate welfare measure, even though they may well be recorded with different recall periods. However, food given away to other households is excluded, as it does not add to the donor's but the recipient's consumption (Deaton and Zaidi 1998). The RLMS asked households to record the consumption of a list of 57 food items and beverages composed of twelve categories (milk products, meat, fish, potato, bread, eggs, oil and fat, fruits, sweets, vegetables, food away from home, and miscellaneous foods). The common recall period of all items is the last 7 days. These items were deemed to be purchased relatively frequently so that this short recall period was adequate. For each item, households reported separately the consumption of purchased, self-produced and in-kind items.

Second, the non-purchased food items need to be valued in monetary terms to include them in the welfare measure. This involves typically identifying reference prices at which food quantities can be valued. The RLMS included separate community price questionnaires, recording high and low Ruble prices for each food item. I used the low prices to assign values to the home produced food items. Subsistence income from agriculture is collected with a 12 months recall period.

Non-food items The RLMS collected information on consumption of 35 non-food categories, covering health and education services, clothing, footwear and headgear, durable goods, rent, taxes and insurance, festivities and ceremonies, and other expenses. In line with other households surveys, the RLMS asked for information on expenditures only, as most non-food items are too heterogeneous to permit the collection of information on quantities consumed. It recorded expenditures, depending on the likely frequency of purchases, with recall periods ranging from the last 7 days to the past 12 months. The information was included regardless of whether items were purchased or received in-kind. The computation of the non-food aggregate involves a simple aggregation over the relevant items. The main difficulties relate to which items to include, and how to deal with durable goods.

Concerning the first issue, the basic principle is that only those

non-food items should be included, which can be considered to add to the consumption of the household. For example, expenditures on taxes and levies or interest on loans are deductions from income, and thus not included. In any case, such expenditures are very small and infrequent. More complicated is the issue of lumpy or infrequent expenditures, such as marriages, dowries, births and deaths. Ideally, one would want to smooth these expenditures linked to rare events over several years but such information is missing. Including them would risk to potentially substantially overestimate the longer-term average of consumption of those households which happened to incur such expenditures during the survey period. I follow common practice and exclude such items.

Durable goods require special treatment as they last typically for several years, so that lumpy and infrequent expenditures on durable goods are not a good indicator of the utility derived from these goods during the reference period. Instead of including purchases of durable goods, I follow the standard procedure to estimate the flow of services accruing to the household from the owned durable goods, based on their current value.

The underlying principle for housing is the same as for other consumer durables. The consumption aggregate should include the value of the flow of services received by the household from occupying its dwelling. Assuming rental markets are well functioning, the rent of the dwelling could be used as such measure. However, many households own the dwelling in which they reside. The consumption aggregate uses actual rents whenever available and otherwise imputed rents as obtained from hedonic housing regressions. These estimations model the determinants of rent payments for the subgroup of rent paying households to predict rent payments for households not reporting rent payments. The predicted rent payments and imputed rent estimates match each other fairly closely nationally, though there are some differences across regions.

Cost of living differences To compare welfare in different parts of the country and over time, consumption has to reflect differences in the cost of living. Round 5 to Round 8 were implemented over a period of four years, and households interviewed at the beginning of

the survey period faced different prices than households at the end of the period. Adjustment over time is important due to double-digit inflation rates over parts of the period. Transportation is difficult and expensive, and local markets not well connected, giving rise to possibly large spatial variations in the cost of living. Price differences are taken into account by dividing nominal variables with Goskomstat's monthly state-level consumer price index. The deflation varies both across states (to take account of spatial differences) and across time (to account for different interview dates). Following the convention of the RLMS, Ruble (R) values are expressed in prices as of June 1992.

Income

Income is composed of wage and non-wage income, home production, financial income, and public and private transfers received. In contrast to expenditures, the amount sold to others is added to, and production costs are subtracted from, home production. To underline the impact of behavioural responses to wage arrears, Chapter 7 and Chapter 8 employ slightly modified income concepts. A narrow income concept equals income before private transfers received, and the broad income concept is defined as income including the difference of private transfers received and given, and the amounts of durable sales, borrowing and overdue rental bills.

3.3.3 Poverty Measure

The poverty line is the official poverty line of the Russian Federation. It is calculated by the Ministry of Labour in accordance to recommendations of the World Bank and the World Health Organisation, and adjusted for regional price differences across regions. The food part of the poverty line reflects a food basket constructed on the basis of nutritional criteria. Separate subsistence budgets are calculated for the working-age population, children and pensioners. The derived poverty line has an elasticity of about 0.8 to household size, implying a modest degree of economies of scale (Ravallion and

Lokshin 1998).[8] It varies according to the demographic composition and regional location of a household.

Much of the research on poverty measurement is based on three poverty statistics (Ravallion 1992, Deaton 1997 and Cowell 2003). They belong to the class of measures proposed by Foster, Greer, and Thorbecke (1984) and are characterised by the following equation:

$$P_\alpha = (1/n)\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^\alpha$$

where α is some non-negative parameter, z is the poverty line, y denotes either nominal household consumption or nominal household income, i indexes individuals, n equals the total number of individuals in the population, and q is the number of individuals with expenditures below the poverty line. The measure $P_0 = H$ is called head-count, $P_1 = PG$ the poverty gap, and $P_2 = FGT$ the Foster-Greer-Thorbecke measure. H gives the share of the poor in the total population, PG equals the average expenditure shortfall of the poor relative to the poverty line, and FGT measures the severity of poverty. The measures are additive in the sense that aggregate poverty equals the population-weighted sum of the poverty levels in the subgroups of the population.

These poverty measures can serve as welfare measures in their own right, or be used to derive other welfare measures. For example, Chapter 5 analyses the welfare ratio which is defined as the ratio of household consumption to the poverty line.

[8]See Klugman and Braithwaite (1995) for more details on the construction of the poverty line.

Chapter 4

The Arrears Crisis

4.1 Introduction

This chapter lays out the macroeconomic and fiscal context for the analysis presented in Part II. It gives a brief account of the scope and causes of Russia's payment crisis in the mid-1990s. The arrears crisis was characterized by a sharp increase in non-cash transactions and arrears, including offsets (the exchange of goods and services for debt), barter (the exchange of one good for another) and debt. The phenomenon marked a partial return to practices from the Soviet era, where enterprises used money primarily as a unit of account.

International data on government transfer and wage arrears are sketchy but the following numbers are suggestive that Russia's experience was typical for other transition countries:

- Azerbaijan: The financial gaps of the public pension system amounted to 0.7 percent of GDP in 1999, or about 25 percent of total outlay.
- Baltic countries: During 1999, 20 percent of workers in Lithuania, 15 percent of workers in Latvia and 14 percent of Estonian workers experienced delays in payment of wages (Aasland and Tyldum 2000).
- Bulgaria: According to Bulgaria's Confederation of Independent Trade Unions, the overall backlog in unpaid wages owed

to public sector workers or workers in wholly or partially state-owned enterprises amounted to of $150 million in 2000, equal to about 500,000 average monthly industrial wages.

- China: According to figures published by the All China Federation of Trade Unions, the total wage arrears of 13.9 million workers across the country amounted to $13.9 billion in 2000. According to figures from the Ministry of Labour and Social Security, arrears in pensions during the period from January to May 2000 alone totalled $1,174 million (Pringle 2001).

- Kazakhstan: Arrears in wages stood at 6 percent of GDP and arrears in pensions at 2 percent of GDP at the end of 1996 (World Bank 1998).

- Kyrgyzstan: About 58 percent of workers experienced delays in wage payments in 1993, and 24 percent in 1996 (Namazie 2002).

- Tajikistan: According to World Bank estimates, a third of the formal sector employees reported wage arrears in 1998

- Ukraine: According to the 1999 International Labor Organization (ILO) labour survey, over 80 percent of all factories had difficulty paying their wages, and wage arrears lasted on average for over 20 weeks. The IMF estimates that arrears to the pension fund, which finances pensions to 14 million elderly, increased from 0.1 percent of GDP in 1995 to 1.4 percent in 1996 and 1997 and to 1.9 percent of GDP in 1998.

4.2 Scope

The very nature of Russia's payment crisis implies that reliable data on its extent and pattern are scarcely available. Unorthodox and frequently changing budgetary classification rules, cash rather than accrual-based accounting, the hybrid public-private nature of some agencies, contingent liabilities and the non-monetary means of payment make it difficult to construct consistent time series.

4.2.1 Enterprises

Arrears of the enterprise sector rose from less than 10 percent in 1994 to close to 25 percent of GDP in 1998 (International Monetary Fund 1999). The growth in arrears reflected to a large extent rising arrears in taxes and contributions to extra-budgetary funds, which increased by about 5 percent of GDP. Wage arrears amounted to around 2 percent of GDP in 1996 and 1997, and rose to 3.3 percent in 1998. Non-monetary means of transactions also increased during the mid 1990s. Barter, as a percentage of industrial sales, increased from about 5 percent in 1992 to almost 50 percent in 1998. Some estimates suggest that about half of barter was arranged through chains and intermediaries. Offsets, involving the mutual settlement of preexisting debts, were common among enterprises. Veksel, as a primitive form of tradable promissionary notes, issued by banks, large enterprises and different levels of governments, became a frequent feature in offsets.

4.2.2 Government

The public sector was often part of offset arrangements, writing off enterprise tax arrears for cancellations of government debts to enterprises. All levels of government practised such tax offsets. While some tax offsets were initiated in response to the lack of government liquidity, others were an integral part of transactions right from the outset. Tax arrears to the consolidated budget grew from around 3.4 percent of monthly GDP in January 1993 to some 80 percent of monthly GDP by mid 1997. The share of cash receipts in federal tax revenues dropped from 95 percent in 1994 to 55 percent in 1998. The numbers for local budgets are likely to be of similar order, and possibly even lower.

The crisis became especially severe in 1996. According to the State Tax Service, about one third of all enterprises did not pay any taxes, and only 17 percent of all enterprises regularly settled tax liabilities on time. Federal tax revenues failed to reach either the revenue targets in the federal budget or the tax revenue floor as stipulated in IMF loan agreements. Federal budget revenues were about 15 percent below plan and 18 percent short of the revenue

target specified in the original IMF Extended Fund Facility. The IMF targets were subsequently lowered in September, and then again in December, ensuring that the year-end revenue target was met.

State energy monopolies, such as Gazprom (gas monopoly) and RAO UES (electricity monopoly), provided large implicit subsidies to enterprises through arrears and transactions at off-market prices, amounting for most of the mid-1990s to around 4 percent of GDP (Pinto, Drebentsov, and Morozov 2000). Figures on arrears in government spending are sketchy, but estimates suggest they amounted about 2.5 percent of GDP in 1996 and 2 percent of GDP in 1997 for the federal government alone (Ivanova and Wyplosz 1999).

These figures indicate that the payment crisis was directly related to a fiscal crisis (Table 4.1). The persistent decline in revenues required repeated down-scaling of government expenditures in order to contain the budget deficit. Russia's consolidated government expenditures in 1998 were down by over 6 percent compared to 1994. In spite of the cutbacks on spending, the fiscal deficit exceeded the targets specified in the 1996 IMF adjustment program during 1996 to 1998 by between 3 to 5 percent of GDP.

4.3 Origin

While there is some dispute about the underlying causes for this crisis (Alfandari and Schaffer 1996 and Ivanova and Wyplosz 1999), it is likely that a combination of mutually reinforcing factors contributed to the problem. At the microeconomic level, most explanations link the crisis to a failure to enforce hard budget constraints at the enterprise level (International Monetary Fund 2000). At the macroeconomic level, the payment crisis emerged against a backdrop of strict disinflation policies, pursued since the end of 1994. The government shifted from monetary financing of the deficit to bond financing, created a flourishing bond market of short-term bills, and anchored the exchange rate in a corridor vis-a-vis the US-Dollar. These policies facilitated the emergence of a payment crisis for three reasons.

Table 4.1: General government budget (percentage of GDP)

	1992	1993	1994	1995	1996	1997	1998	1998-92
Total revenues	39.1	36.2	34.6	34.1	33.5	36.5	33.4	-5.7
Consolidated	28.6	27.8	25.7	26.6	25.8	27.5	25.2	-3.5
Federal	16.7	13.7	11.8	12.9	12.5	12.3	11.0	-5.7
Regional	13.5	16.7	18.0	15.6	16.4	18.5	16.2	2.6
Fiscal transfers*	1.6	2.6	4.1	1.8	3.0	3.4	2.0	0.4
Extra-budget	10.9	8.6	9.1	8.0	8.1	9.9	8.7	-2.3
Federal transfers	0.0	0.2	0.1	0.5	0.5	0.9	0.4	0.4
Total expenditures	57.8	43.6	45.0	40.2	42.4	44.4	41.4	-16.4
Consolidated	39.1	36.3	40.7	34.5	37.6	38.8	34.3	-4.8
Federal	27.1	20.2	23.2	18.6	20.9	19.4	16.9	-10.2
Regional	12.0	16.0	17.5	15.9	16.7	19.4	17.4	5.4
Extra-budget	8.3	8.0	8.6	8.0	8.2	9.8	9.6	1.2
Import subsidies**	12.0	2.1	0.0	0.0	0.0	0.0	0.0	-12.0
Deficit	-18.2	-7.3	-10.4	-6.1	-8.9	-7.9	-8.0	10.2
Federal	-10.4	-6.5	-11.4	-5.7	-8.4	-7.1	-5.9	4.5
Regional	1.6	0.6	0.5	-0.3	-0.4	-0.9	-1.2	-2.8
Extra-budgetary	2.6	0.6	0.5	0.0	-0.1	0.1	-0.9	-3.5
GDP in R trn	19.2	171.5	611	1540	2146	2522	2696	

Source: IMF 1999, 2000; Ministry of Finance.
*From federal to regional budgets. **Outside the budget.

4.3.1 Economic Factors

First, the real exchange rate appreciated as the programmed rate of exchange rate depreciation was typically below the rate of inflation. With hindsight, this led to an 'overvaluation' of the Ruble, which contributed to the low competitiveness of Russian enterprises. Productivity increases did not match the rise in the real exchange rates as, among other reasons, weak corporate governance resulted in a lack of effective restructuring of enterprises. Manufacturers were largely unable to compete with foreign imports on domestic markets, access to which had been widely liberalized, and were unsuccessful at selling products abroad.

Second, with firms struggling to find customers, the government's political imperative was to provide support to enterprises. With monetary financing of budget revenue shortfalls ruled out, the government replaced explicit subsidies to the enterprise sector, which had been faced out in the first half of the 1990s, by implicit subsidies. They came in two main forms. The government lowered the effective tax rates on enterprises by allowing tax arrears without the enforcement of bankruptcy, declaring tax amnesties and valuing firms' output at inflated prices for tax offsets. In addition, the public sector provided energy inputs through the main energy monopolies at below market prices. These practices softened enterprise budget constraints and worsened the liquidity of the public sector. The flipside of the cash shortage was an increase in public debt and the rise in payment arrears to pensioners, family with children and other welfare recipients. This not only added to the arrears problem in the economy as a whole but also had destructive impacts on tax discipline via negative demonstration effects. Enterprises could legitimize running up wage and tax arrears by pointing to the government's own track record of unpaid bills.

Third, the payment crisis reached systemic dimensions as a result of thick market externalities and network effects. The more enterprises engaged in non-monetary transactions, the more difficult it became for fundamentally viable enterprises to find firms willing to pay in cash. In consequence, they were forced to deal in barter or with offsets. This process was accelerated by multilateral non-monetary

transactions, which typically involved the public sector. While most firms owed taxes to the state, only some of them directly supplied to the public sector. The government or public utilities issued tax offsets that were passed on not just to its direct supplier but also to enterprises with claims on the government's direct supplier.

4.3.2 Fiscal Factors

The Soviet Union was a federation more in form than in substance (Schiffer 1989).[1] After its breakdown, the bargaining between regions, which favoured greater autonomy, and the centre, which argued for the preservation of Russia as a federation, led to a shift of influence away from Moscow. The outcome was a form of hybrid federalism, which combined national and territorial elements of the ethno-federal legacy. The constitution of December 1993 defines Russia as a three-tiered federal state consisting of 89 'subjects' (krais, oblasts, okrugs, autonomous regions, national regions, metropolitan cities (Moscow and St. Petersburg) and autonomous republics). All governments, whether federal, regional or local, have independent budgetary and administrative status. The federal government accounted in 1998 for over 41 percent of all expenditures (including transfers), as against 42 percent for regional budgets, 6 percent of which was financed by transfers from the centre to the regions.[2] Regional budgets collected also a higher share of total revenues (48 percent compared to 33 percent for the federal budget).

The fragmentation of the government proved detrimental for both for revenue collection as well as expenditure management (Grafe and Richter 2001). The decline in overall revenues was accompanied by an increase in the relative revenue share of subnational budgets. The drop in tax revenues from shared taxes, together with the reduction in federal transfers to the regions after 1994, resulted in growing financial independence of subnational governments, which relied increasingly on its own revenue sources, including borrowing from emerging market investors. The federal government was unable to

[1] See Atkinson and Micklewright (1992) for an assessment of regional differences in living standards in the Soviet Union.

[2] Extra-budgetary funds accounted for the rest.

enforce a uniform tax allocation system across the federation, as some regions were granted special fiscal arrangements. Regions threatened to split from the federation in order to extract tax concessions from the centre. In addition, the bottom-up system of tax collection enabled regions to withhold revenues from the centre. Furthermore, regions had a strong incentive to collect taxes in non-cash form, since this resulted in less cash revenues had to be shared with the federal government. Finally, sequestration of federal transfers put further strain on relationships between the federal government and regions. In 1996, federal transfers fell 15 percent short of the level stipulated in the budget law, and most of them were paid out only at the end of the year. In anticipation of delayed and reduced transfer payments, regions withheld tax revenues from the federal government, adding to the dilution of federal government control. Similarly, they reacted to sequestration by building-up precautionary balances to ensure the financing of top-priority programmes that might later fail to obtain funding.

The federal authorities responded to the decline in budget revenues by transferring expenditure obligations to lower-level governments. By 1996, the share of regional and local budgets in consolidated non-interest expenditures had increased to over one half. About 75 percent of spending on industry, agriculture and other production activities and over 80 percent of that on social programmes were at subnational levels (Table 4.2). As a result of new expenditure responsibilities, subnational budgets run deficits from 1995 onwards. Decentralization of government spending was facilitated by the fact that expenditure responsibilities of the different government levels were not prescribed by law. The federal government was thus able 'unilaterally' to unburden itself of expenditures without violating any expenditure code. In addition, legal arrangements specified by the federal government over enterprise privatisation meant that social assets from enterprises were transferred mostly to local governments.[3]

Weaknesses in the budget management system contributed to the fiscal crisis. The absence of centralized control over government spending made it difficult to impose fiscal discipline, or to protect

[3]Frye and Shleifer (1997) estimate that the associated fiscal burden on local budgets amounted to around 2 percent of GDP.

Table 4.2: Social spending of the general government sector (percentage of GDP)

	1994	1995	1996	1997	1998
Total social spending	23.1	19.8	20.7	23.7	22.0
Budgetary programmes	14.5	11.8	12.6	14.0	12.3
Federal	1.4	1.2	1.4	2.1	2.4
Education	0.9	0.6	0.5	0.6	0.5
Health	0.4	0.4	0.4	0.6	0.5
Social policy	0.2	0.2	0.5	0.9	1.4
Local	13.1	10.6	11.2	12.0	9.9
Housing	5.5	4.0	4.2	4.3	3.5
Education	3.6	3.1	3.4	3.7	3.1
Health	2.8	2.4	2.4	2.7	2.2
Social policy	1.1	1.1	1.3	1.3	1.0
Extra-budgetary programmes	8.6	8.0	8.1	9.7	9.7
Pension fund	6.1	5.6	5.9	7.0	7.1
Employment fund	0.4	0.4	0.3	0.3	0.3
Social insurance fund	1.1	1.1	1.2	1.2	1.2
Medical insurance fund	1.0	0.9	0.7	1.1	1.2
GDP in R trn	611	1540	2146	2522	2696

Source: IMF 2000, Ministry of Finance.

high priority spending items. Without a fully developed treasury system, the Ministry of Finance lacked control over all stages of the spending proces s (commitment, verification and payment). Revenue projections in budgetary legislation were too optimistic, and fiscal consolidation came at the cost of ad hoc sequestration and government arrears. Furthermore, some fiscal regulations created incentives for enterprises to engage in non-monetary transactions. For example, taxes like VAT were levied only on a cash basis. Enterprises with tax arrears were required to channel all transactions through one bank account, and any money coming through this account was to be directed to the state tax service.

4.4 Conclusion

The non-payment crisis in the mid-1990s was fuelled by a difficult economic transition, weak fiscal management and a fragmented public sector. It involved government and enterprises and cash transfer recipients and workers. The following chapters will investigate in detail the implications for household welfare of the rise in arrears of government transfers and wages.

Part II

Analysis

Chapter 5

Poverty and Cash Transfers

5.1 Introduction

What is the impact of government transfers on household consumption? Standard incidence studies compare the distribution of consumption levels before and after government intervention. Typically, only the post-intervention distribution is observed, and the pre-intervention distribution is approximated by subtracting the amount of government transfers from actual consumption. This procedure assumes implicitly a propensity to consume from cash transfers of unity. Yet, the propensity to consume differs from unity in the presence of consumption smoothing.[1] Households may smooth consumption over income fluctuations. They may arise from payment arrears or volatile returns on agricultural activity and home production, like changing weather conditions, sickness, and price fluctuations (Deaton 1997, Paxson 1992, Townsend 1995 and Wolpin 1982),[2] or, as considered in this analysis, changes in government transfers (Cox and Jakubson 1995, Ravallion et al. 1995 and Van de

[1]Other reasons, such as variation of the propensity to consume over the life cycle of household members or by the recipient of cash transfers, are not considered explicitly (Strauss and Thomas 1995). The analysis does also not explore the difference between average and marginal propensities to consume.

[2]Besley (1995) describes how households overcome the lack of formal insurance and credit markets that characterises many developing and transition countries.

Walle 1995). The elderly with pension arrears may take on new jobs, receive transfers from their children, or sell off assets in order to keep consumption levels constant.

This chapter develops and applies a new approach for measuring the impact of government cash transfers on poverty alleviation that takes into account consumption smoothing of households. The methodological contribution is twofold. First, building on work by Ravallion et al. (1995), I estimate reduced-form regressions to obtain the propensities to consume from government cash transfers separately for each transfer type. As the scope for endogenous transfers of families with children receiving child benefits is different than for elderly on old-age pensions, the coefficients are likely to be different across transfers. In addition, some cash transfers are more regular sources of income than others, suggesting differences in the propensities to consume according to Friedman's permanent income hypothesis. Following Deaton (1997) and Wolpin (1982), I use IV techniques to separate transitory from permanent income components, and compare the degree of consumption smoothing across types of cash transfers. The regressions confirm that the propensity to consume from transitory income is lower than from permanent income. Furthermore, pensions, as a more regular form of income source than other incomes, have consistently higher coefficients than other incomes. Second, I extend an established decomposition technique to disentangle the impact of changes in government transfers from changes in the pre-transfer expenditure distribution on poverty.

The methodology is applied to investigate the impact of government cash transfers on poverty alleviation in Russia during 1994 to 1998. The dramatic changes in living standards and the high prevalence of arrears in government transfers make Russia a rich source for studying the benefit incidence of government transfers. The analysis is based on household data from the RLMS and regional data from official sources in Russia. I trace the incidence of payment arrears for pensions and child benefits, account for factors underlying the changes in cash benefits, estimate the propensities to consume corresponding to the various transfer types, and simulate poverty rates for counterfactual distributions of government transfers. The results of the analysis highlight the interplay between fiscal and polit-

ical pressures, cash transfer levels, and poverty rate dynamics during this period of macroeconomic adjustment. The need for fiscal consolidation implied cuts in social expenditures, while political demands called for higher social benefits. The outcome was characterised by a combination of increases in benefit entitlements at the cost of greater benefit arrears (especially in fiscally weak regions), contractions in real benefit levels due to a lack of inflation indexing, and higher poverty. The changes in government transfer policies since 1994 accounted for at least one seventh of the rise in poverty between 1994 to 1998.

The analysis in the paper uses the Russian Longitudinal Monitoring Survey (RLMS). The results presented here are based on the four rounds (Round 5 to Round 8) of the second phase of the survey. Most of the analysis is based on a balanced panel of households represented in all four rounds. This panel contains 2250 households with 5579 individuals, which represents a reduction in size compared to the cross-section of about 40 percentage. The basic indicator of living standards is the welfare ratio, defined as the ratio of household expenditures to the poverty line.

The structure of the paper is as follows. Section 5.2 looks at the incidence of pension and child benefit arrears, and presents the regression analysis for the propensities to consume from these transfers. Section 5.3 describes and implements the decomposition technique. The final section concludes.

5.2 Consumption Estimation

5.2.1 Estimation Procedure

This section outlines the strategy for identifying the propensities to consume from government transfers. It explains a range of practical issues, including the definition of payment arrears, measurement error, sample selection bias, the distinction between transitory and permanent income components, and the choice of the estimators.[3]

[3]This econometric analysis owes much in approach and spirit to Case and Deaton (1998).

Following Ravallion et al. (1995), I estimate the propensities to consume from government transfers by regressing household current expenditures on government transfers. The key parameter is the coefficient on government transfers. A value of unity implies that a marginal increase in government transfers leads to an equivalent rise in expenditures. The estimate may differ from unity, and may vary both by income source and household type. According to Friedman (1957), households smooth over income variations in order to keep consumption constant at the level of permanent income over their lifetime. In other words, the propensity to consume depends on whether income is permanent or transitory. Receipts from regular income sources are mostly consumed, and one-off incomes tend to be saved. The spending behaviour is also affected by the life expectancy (or discount rate). For example, abstracting from payment arrears, pensions accrue to the pensioner until the end of her lifetime. If the life expectancy of the household is similar to the life expectancy of the pensioners, or the allocation of pension income follows the non-altruistic preferences of the pensioner, pensions come close to a notion of permanent income. In contrast, the planning horizon of a household with children is likely to exceed the period for which the household is entitled to receive child benefits. Hence, the theory predicts that pensions are more closely linked with consumption than child benefits. In addition, the scope for endogenous reactions to compensate for variations in cash transfers varies across household types. For example, it may be easier for pensioners to take on a new job than for parents in regular employment who have to look after their children.

Recognising these features, I estimate separately the propensities to consume from pensions and from child benefits. The pension regressions refer to the subsamples of households with at least one eligible pensioner, and the regressions for child benefits are based on the subsample of households with children. To assess the impact of household composition, these estimates are compared to those obtained from households receiving both pensions and child benefits. Investigating food expenditures rather than total consumption serves as sensitivity check. While the welfare implications of some forms of expenditures may be unclear, it is hard to argue that food expendi-

tures do not increase household welfare, especially in the context of poverty alleviation.

The regressions include standard control variables for household needs and preferences, such as the number of children by age group, the number of elderly and age, gender, and educational attainment of the household head. The basic regression specification excludes other income than cash transfers as it controls for part of the endogenous response that is identified by the coefficient on the cash transfer variable. Subsequent regressions add income before cash transfers to the set of covariates to explore whether cash transfers are treated in the same way as other income.

It may seem that measurement error is not a major concern. Pensions and child benefits are supposedly regular monthly payments, which are likely to be reported correctly by the household. However, for the episode under consideration, arrears in payments were widespread. Reported amounts could reflect payments of fractions of government transfers. For pensions, Pension Fund data provides a cross-check on the dynamics of the pension arrears crisis as portrayed by the RLMS. For child benefits, I match reported receipts with potential entitlements, calculated from official benefit rules, and actual receipts. The analysis suggests that there is little evidence for payments of fractions of cash transfer entitlements.

Sample selection is present if unobserved household features or community characteristics affect both household expenditures and the likelihood of receiving a cash transfer. In this case, estimates of the propensity to consume for the group of households receiving cash transfers are not unbiased estimates for the group of eligible households as a whole. I investigate two aspects. First, low take-up of cash transfers is an unlikely source for sample selection bias for the group of eligible households. Second, probit regressions are used to identify the factors influencing the incidence of arrears in cash transfers. Controlling for these characteristics in the propensity to consume regressions, I cannot fully exclude the possibility of self-section of households into arrears status. As a sensitivity check, the estimates obtained from the whole sample of eligible households are compared with estimates from the subsample of those who received payments.

The ultimate objective is to derive counter-factual poverty rates for different cash transfer regimes. These should be based on the propensities to consume from permanent rather than transitory income flows. The standard procedure is to instrument cash transfers with variables that are correlated with permanent income component but orthogonal to transitory income components. Plausible instruments are determinants of the incidence in payment arrears and household-level variables that proxy for benefit rules. However, household demographics not only determine benefit rules, but are also likely to affect household spending directly. Households with payment arrears offer a simple test for the specification, as their demographic characteristics are not collinear with cash benefits received.

The instrumentation of income without cash benefits entails separate issues (Deaton 1997). A significant share of income and consumption is accounted for by household or dacha production that is neither sold nor bought in the market. The value for home production is included in both household income and expenditure, and any error in the calculation of this imputed value adds an error component to both the income and expenditure variables. The positively correlated measurement error may overcompensate the standard attenuation bias caused by measurement error in income and lead overall to an upward bias in the estimated propensity to consume. Income excluding home production can be used as instrument for other income. In addition, the permanent components of other income can be identified using labour market characteristics of the household head as instruments.

Exploiting the panel dimension of the RLMS, regressions are run both in levels and in changes. The level estimators ignore the panel dimension of the data set, but suffer less from certain types of attenuation biases through measurement error than first-differences estimators. This issue is especially relevant for instrumenting changes in cash transfers, as instruments related to non-monetary household characteristics are typically fairly constant across rounds. However, the estimators based on first-differences are more robust to the omission of any time-invariant regressors, even if they are correlated to observable explanatory variables.

5.2.2 Pensions

The Pension System

The pension system originates from the Soviet period, when it was part of a comprehensive social insurance programme (Barr 1992).[4] At the end of 1996, the Pension Fund had 38 million beneficiaries (26 percent of the population), including 29 million Russians above retirement age (55 for women, 60 for men) and 3.8 million disability pensioners. People above retirement age qualify for normal old-age pensions after 25 years (20 years for women) of employment. Pensions are an important income source for household with pensions, amounting to one third of expenditures (75 percent of the poverty line) in 1994 and one fifth of expenditures (50 percent of the poverty line) in 1998. The take-up of pensions amongst the old-age population according to the RLMS is over 95 percent across the whole period. Pensions are earnings-related but subject to a low ceiling. They are fixed at 55 percent of the average wage earned either for the period of the last two years of employment, or for any period of 60 working months in a row. Pensions are no higher than 75 percent of this average wage, or three times the minimum wage. The benefit levels are not indexed to inflation, however, the levels of minimum pensions and minimum wage are legislated by the Duma, and revised four times a year.[5] Expenditures of the Pension Fund amounted to 6.6 percent of GDP in 1998, which accounts for over three quarters of all social cash transfers (Table 5.1). Over four fifth of the pensioners draw old-age pensions, which are financed on pay-as-you-go basis by payroll taxes amounting to 29 percent of employee wages.[6] The disability, military, and loss of provider pensions are co-financed by federal transfers, which amount to less than 10 percent of the Pension Fund's overall expenditures.

[4]This section summarizes the main feature of the pension system as of the mid 1990s. More details, and an overview of recent reforms, are provided in Denisova, Gorban, and Yudaeva (1999).

[5]Since February 1998, pensioners can opt for a new system of pension calculation based on individual coefficients.

[6]The contribution is split into 28 percent and 1 percent between employer and employee.

Table 5.1: Social cash transfers

		1994 (1)	1995 (2)	1996 (3)	1997 (4)	1998 (5)
Budgetary Spending						
As Percentage of GDP						
	Overall cash transfers	7.6	6.8	7.6	8.6	8.8
	Social transfers	1.6	1.4	1.9	1.9	2.2
	Child Benefits	0.7	0.6	0.7	0.7	na
	Pensions	6.0	5.4	5.7	6.7	6.6
As Percentage of 1994						
	Overall cash transfers	100	76	79	92	87
	Social transfers	100	78	98	101	96
	Child Benefits	100	81	86	82	na
	Pensions	100	76	74	89	85
Pension Entitlement Rules (Ruble; October of each year)						
	Average Pension Entitlements	1572	1342	1522	1446	1071
	Minimum Pension	840	636	1046	927	622
Child Benefit Entitlement Rules (Ruble; October of each year)						
Standard	Up to 1.5 years	356	333	723	705	444
	1.5 to 6 years	249	233	253	247	155
	6 to 16 years	213	233	253	247	155
Single Parents	1.5 to 6 years	373	350	380	493	311
	6 to 16 years	320	350	380	493	311
Soldier families	1.5 to 6 years	373	350	380	370	233
	6 to 16 years	320	350	380	370	233
Poverty Rates						
Head-Count	total	12.4	17.4	17.1		33.0
	SE	0.8	1.2	1.4		1.8
Poverty Gap	total	3.8	5.2	5.6		10.9
	SE	0.3	0.4	0.6		0.7
FTG, a=2	total	1.7	2.3	2.7		5.2
	SE	0.3	0.4	0.6		0.7
Pension Receipt amongst Eligible Individuals						
	%	97	91	66		85
	SE	0	1	3		1
Child Benefit Receipt amongst Eligible Families						
	%	66	55	38		20
	SE	2	2	3		2

Source: MOF, Goskomstat.
Notes: The pension and child benefit entitlements refer to October of each year. Child benefits for students are paid until the age of 18 rather than 16.

The Pension Fund is an extra-budgetary agency of the federal government. Its budget management is independent from those of the rest of the public sector. The system was traditionally administered centrally, but has been decentralized since transition. The Pension Fund consists of one federal department, 89 regional departments (each with a separate agreement with the central fund), and 2342 local departments. Despite this decentralization, however, there is a uniform vertical structure throughout the regions. The Pension Fund is only in charge of collection pension contributions, while the identification of recipients and the pension payment is the responsibility of the Social Welfare Office.[7] Payroll taxes are paid into the transit accounts of the Pension Fund at the local level, and then accumulated at the regional level. The regional branches of the Social Welfare Offices receive the funds and pass them down to their local accounts. The recipients collect the pension at post offices, social welfare offices, the state-owned savings bank Sberbank, or receive payments through the delivery services of these institutions (Kolesnik 1995). Regions that collect pension contributions in excess of their pension payments, transfer funds to the centre, which then redistributes those to regions whose collection falls short of pension entitlements. The transfer amounts are specified in separate agreements between each region and the Pension Fund.

Pension Arrears

The Pension Fund had at times difficulties in collecting sufficient revenues to cover pension obligations. The revenue crisis reflects poor compliance and financial difficulties of enterprises, as well as delays in contributions from the Ministry of Finance. Faced with funding shortfalls, the Pension Fund incurred arrears in payments. The RLMS contains information about pension receipts in the 30 days preceding the interview (Table 5.1).[8] The numbers suggest a

[7]Since 1995, a number of regions have adopted a system called United Pension System, in which the Pension Fund is responsible also for the identification of entitlements and payment of pensions.

[8]Kernel density estimates and scatter plots of actual versus entitlements to pension receipts suggest little evidence for the settlement of outstanding pension arrears or proportional adjustments in pension payments (Richter 2000).

dramatic rise in pension arrears from about 3 percent in 1994 to over one third in 1996, before arrears dropped back to around 15 percent in 1998. This evidence is consistent with data from the Pension Fund. The shortfall of Pension Fund revenues below plan rose from 8 percent in 1995 to 15 percent, or R22 trillion. In addition, federal transfer arrears increased from R2 trillion in 1994 to R3 trillion in 1995, and then rose to R14 trillion, or 60 percent of the budgeted amounts, in 1996. Payment arrears to the Pension Fund increased from R23 trillion at the end of 1995 to R60 trillion at the end of 1996 and R88 trillion at the end of 1997. According to Pension Fund press releases quoted in Moscow Times, arrears in pension payments amounted to R8 trillion in September 1995, and increased from R7 trillion in July 1996 to R14 trillion in December 1996. All arrears were paid off by July 1997, but non-payment resumed again and reached a level of R30 trillion in September 1998. Pension arrears remained roughly constant until January 1999, after which they started to fall again.

What determines the rationing of pension payments? The decentralised pension collection and payment system suggests the existence of regional differences in pension arrears. Regions that face funding shortfalls might prioritise their own pensioners, and transfer only residual sums to the centre for redistribution to other localities. In this case, the incidence of pension arrears should reflect regional differences in the pension contribution base and dependency ratios, and in the infrastructure for pension payments. There is indeed a large variation in pension arrears across regions. As shown in Table 5.2, pension are higher in rural than in urban areas, and while at most 5 percent of pensioners suffered from pension arrears in the Metropolitan area (Moscow and St. Petersburg) in any of the rounds, the share in the Caucasian area reaches 55 percent in 1996. Furthermore, regions that paid pensions had higher tax collection, higher government expenditures, lower shortfall of government spending compared to plan, and higher regional output than regions that had incurred arrears (Table 5.3).[9] Pensioners suffering from ar-

[9]As the Pension Fund does not publish regional data on pension contribution collection and payment arrears, these variables are proxied with the oblast-level variables tax collection, tax arrears, government expenditure, government expen-

Table 5.2: Regional incidence of pension receipt

		Receipt *% of Entitlement*			
		94	95	96	98
		(1)	(2)	(3)	(4)
Overall					
	%	97	91	66	85
	SE	0	1	3	1
Settlement Type					
Urban	%	97	93	75	87
	SE	0	1	5	2
Suburban Settlement	%	97	92	69	87
	SE	2	3	10	4
Rural	%	95	86	46	79
	SE	1	2	3	2
Geographical Regions					
Metropolitan	%	97	95	96	97
	SE	1	3	1	3
Northern and North Western	%	99	94	72	87
	SE	0	3	8	5
Central and Central Black-Earth	%	97	91	71	83
	SE	1	2	5	3
Volga-Vaytski and Volga Basin	%	96	92	63	89
	SE	2	2	9	3
North Caucasian	%	95	87	45	75
	SE	1	3	7	5
Ural	%	97	92	69	90
	SE	1	3	11	2
Western Siberian	%	97	80	55	76
	SE	1	6	5	3
Eastern Siberian and Far Eastern	%	97	99	70	86
	SE	1	1	6	4

Notes: The sample includes individuals eligible for pensions. The numbers show the means and standard errors of pension receipt by category during the last 30 days.

rears lived in communities with worse infrastructure for the delivery of pensions (welfare office, post office, and bank) than those without arrears. Regions with arrears had fewer persons in retirement age, suggesting that arrears cannot be explained by differences in pension burden across localities.

The discussion so far confirms the importance of regional fiscal and institutional endowments for pension payment. Beyond these factors, do personal and household characteristics affect the incidence of pension arrears? For example, more educated and richer pensioners might be expected to better work the system and ensure a more regular payment of pensions than others. Table 5.4 compares characteristics of pensioners by arrears status. Arrears pensioners were younger and less well educated, and lived in households with more children, lower expenditures, lower income, and less assets than non-arrears pensioners.

The determinants of pension receipts are further examined in Table 5.5, which shows the probability of pension receipt among pensioners. The first regression presents probit estimates of the probability to receive pensions, including as determinants household income (excluding pensions), demographic composition (including number of pensioners by type (old-age, disability, loss of provider, and military pensioners)), age, gender, employment history, educational attainment, and indicator variables for each geographical regions and rounds (Table 5.4). Income has the expected sign but is insignificant. The set of education variables is jointly insignificant. The results are broadly unchanged, when the variables listed in Table 5.3 are included as proxies for the funding of pension payments.

The next two columns explore the impact of correction for measurement error in income excluding pensions. Column 3 is a linear probability model, and Column 4 a linear probability model in which income excluding pensions is instrumented by labour force characteristics of the household head. The F-statistic on the instruments equals 27. While the coefficients on the variables increase, income still remains insignificant at the 10 percent level.

diture arrears (defined as the short fall of actual spending compared to plan), output (GRP), all of which defined on a per-capita basis, and the number of old-age individuals.

Table 5.3: Receipt of pension and child benefits by local characteristics

		Arrears (1)	No Arrears (2)
Pensions			
Regional-Level Characteristics			
Tax Collection	*Ruble*	11839	18388
	SE	678	1097
Tax Arrears	*Ruble*	3793	4357
	SE	329	487
Government Expenditures	*Ruble*	11461	15779
	SE	477	714
Government Expenditure Arrears	*Ruble*	3896	2398
	SE	444	321
Gross Regional Product	*Ruble*	57696	77498
	SE	2848	3358
Old-age Population	*000*	517	630
	SE	25	35
Cluster-Level Characteristics			
Welfare Office	%	59	75
	SE	5	3
Post Office	%	90	92
	SE	2	2
Bank	%	86	89
	SE	3	2
Child Benefits			
Regional-Level Characteristics			
Support for Families with Children	*Ruble*	403	586
	SE	15	26
Federal transfers	*Ruble*	1554	1983
	SE	90	113
Gross Regional Product	*Ruble*	68769	82662
	SE	4023	4154
Population under the age of 16	*000*	520	620
	SE	20	32
Cluster-Level Characteristics			
Welfare Office	%	69	79
	SE	4	3

Notes: In the top panel, the sample contains individuals eligible for pensions. The numbers show the means and standard errors of state- and cluster-level characteristics for arrears and non-arrears pensioners. In the bottom panel, the sample contains households eligible for child benefits. The numbers show the means and standard errors of state- and cluster-level characteristics for households with and without child benefit arrears.

Table 5.4: Personal and household characteristics by pension arrears status

		No Arrears (1)	Arrears (2)
Houshold Members	#	2.5	2.8
	SE	0.1	0.1
Children	#	0.3	0.4
	SE	0.0	0.0
Pensioners	#	1.6	1.6
	SE	0.0	0.0
Expenditure	*R*	8842	7664
	SE	577	455
Income	*R*	7438	4315
	SE	469	327
Assets	#	3.4	3.3
	SE	0.0	0.1
Male	%	30.8	29.6
	SE	0.9	1.5
Age	*months*	752.9	740.9
	SE	3.6	6.1
Secondary Education?	%	43.9	40.0
	SE	1.6	2.2
Grade Completed in Secondary School	*mean*	7.2	7.0
	SE	0.1	0.2
Studied after School?	%	55.5	49.9
	SE	1.7	2.6
If Studied after School:			
Vocational Diploma?	%	33.7	32.7
	SE	1.4	2.8
Profess-Tech Diploma w/o Secondary Degree?	%	11.8	10.9
	SE	0.9	1.6
Profess-Tech Diploma with Secondary Degree?	%	10.0	11.5
	SE	0.8	1.4
Technical-Medical Diploma?	%	33.0	31.7
	SE	1.0	2.7
University Diploma?	%	22.0	19.0
	SE	2.0	2.0
Graduate Studies?	%	0.4	0.8
	SE	0.0	0.1
Ever worked?	%	75.9	74.9
	SE	1.2	1.6
If Ever Worked:			
Year last worked	%	8619	8686
	SE	30	41
Years worked	%	3619	3574
	SE	28	39
Occupational Code for 1991	*mean*	2281	2559
	SE	95	159
Occupational Code for 1985	*mean*	4061	4404
	SE	129	184

Notes: The sample contains individuals eligible for pensions. The numbers show the means and standard errors of personal and household characteristics for arrears and non-arrears pensioners.

Table 5.5: Determinants of the probability to receive pensions

		Probit (1)	Probit (2)	OLS (3)	IV (4)	Probit (5)	Probit (6)
Income Excluding Pension	*Coef*	5E-06	2E-06	7E-07	0.015	2E-06	6E-06
	t-st	0.8	0.5	0.7	1.4	0.4	1.1
Pension in Round 5	*Coef*						-6E-05
	t-st						-1.4
F-TESTS (Stats/Signif)							
Education		1.2/.29	0.57/.75	0.32/.93	9.7/.00		
Pensioner type		1.7/.17	9.0/.00	1.8/.16	17.5/.00	8.7/.00	8.6/.00
Cluster and regional variables			2.5/.07	14/.00	29.2/.00	2.5/.06	0.9/.44
Income IV					26.5/.00		
Number of Observations		6512	6512	6512	6512	6512	4225

Notes: The dependent variable is an indicator variable for pension receipt. The sample includes individuals eligible for pensions. All regressions include indicator variables for pensioner type, rounds, and geographical regions, and the variables household size, number of children by age group, the numbers of pensioners by type, and age, gender, and the occupational code for 1985 and 1991 of the pensioner. The education variables in columns 1 to 4 are grade level completed in secondary school, vocational diploma, professional-technical diploma without secondary degree, professional-technical diploma with secondary degree, university diploma, and graduate diploma. The cluster- and oblast-level variables in columns 2 to 6 are the first nine variables listed in Table 5.3. Income excluding pension in Column 4 is instrumented on indicators for whether the head participates in the labour force, has a job, has wage arrears, and on the occupational code for the primary and secondary jobs of the household head.

The income loss of pensioners from arrears is related to the size of the pension. The last two regressions look for evidence whether the size of the pension matters for pension arrears. Potential pension receipts are proxied by actual pension receipts in 1994, and the sample is restricted to those pensioners who did not incur pension arrears in 1994.[10] Educational attainment and employment history are dropped to avoid collinearity problems with the proxy for potential pension receipts. Column 6 shows that the coefficient on 1994 pension receipts is insignificant and has the wrong sign. Income still remains insignificant at the 10 percent level. Overall, there is little systematic evidence that observable personal and household characteristics like income excluding pensions or education affect the probability of pension receipt.[11]

[10]The correlation coefficients of pension receipts amongst those receiving pensions with Round 5 pension payments is 0.82 in Round 6, 0.72 in Round 7, and 0.71 in Round 8.

[11]Chapter 6 reports evidence for specific payment rules during the 1996 pension crisis, but income remains insignificant.

Identification

The estimation of the propensity to consume from pensions faces an identification problem. If elderly people have differing tastes for household expenditures than working-age adults, then the number of pensioners should enter the regression in its own right. However, the number of pensioners should be an instrument for pension receipts, as it is an important predictor of pension income.[12]

Table 5.6 deals with this issue. The first regression shows the simplest case. Household expenditures are regressed on pension income, household size, the number of children, and age, gender, and educational attainment of the household head, and regional dummy variables. The marginal propensity to consume from pension income equals 0.45, and the coefficient is significant at the 1 percent level. The next column adds the numbers of pensioners by category. Their coefficients are negative, and the F-test indicates that these variables are jointly significant. These estimates imply at face value that pensioners tend to spend less than working-age adults. However, the numbers of pensioners are a good predictor for pension income, and the coefficients may simply pick up the collinearity with pension income. Indeed, the propensity to consume increases to 0.55 (Column 2). This interpretation is supported by the next regression, which presents the estimates for the sample of pensioners who did not receive any pensions. It provides a test on the direct effect of the numbers of pensioners on household expenditures. The numbers of pensioners are now jointly insignificant, although the number of old-age pensioners and the number of disability pensioners remain individually significant. Column 4 returns to the full sample and adds the number of male and female persons of the age 50 or over, as preferences should not change at the moment a person reaches pension-age and may differ by gender. The final column displays the choice of variables that I will use in the further regression analysis. The variables for the numbers of pensioners by category are dropped

[12]Case and Deaton (1998) emphasis the identification problem in their analysis of the behavioural impact of social pensions in South Africa. The issue is less of a concern in this analysis, as both the regional variation in pension arrears and the employment history of pensioners are good additional predictors of pension income.

from the regression which reduces the propensity to consume slightly from 0.51 to 0.49.

Estimation

Column 1 of Table 5.7 summarises the key parameter estimates for the basic specification from a range of cross-sectional regressions on the sample of households with persons eligible to receive pensions. In all cases, household expenditure is regressed on income variables, while controlling for household size, the number of children by age category, the number of male and female persons of the age 50 or over, and age, gender, and educational attainment of the household head. The regressions vary in two respects. First, the income variables differ. Initially, only income from pension receipt is included (rows 1 and 2), before income excluding pensions is added (rows 3 to 5). Second, the estimates of both OLS and IV regressions are presented. For the regression with pensions and other income as separate explanatory variables, the estimates from 3SLS regression are shown. The results are now discussed in more detail.

Row 1 displays the coefficient on pension income from the basic regression already discussed above. The marginal propensity to consume equals 0.49, and the coefficient is measured significantly. Row 2 instruments pension income with the numbers of pensioners by type, a set of employment history variables of the household head, the average official pension level by oblast, and the set of cluster- and oblast-level variables used in the probit regressions in Section 5.2.2. The coefficient on pensions rises to 0.56, suggesting that the propensity to consume from permanent income components is moderately higher than from transitory income components.

This result is investigated further by including other income into the regression. Other income in pensioner households is likely to be more transitory than pension receipts, and, following the permanent income hypothesis, one would expect a lower propensity to consume from other income. The results of the regression are shown in Row 3. The OLS estimate for pensions equals at 0.53, and the coefficient on other income is 0.52. An F-test fails to reject the equality across the two coefficients. However, in view of the measurement problems

Table 5.6: OLS regressions on household expenditures and covariates

		(1)	(2)	(3)	(4)	(5)
Pension	*Coef*	0.45	0.55		0.51	0.49
	t-st	6.0	8.8		7.7	7.4
Household Size	*Coef*	1644	1751	1845	1744	1808
	t-st	11.2	10.8	4.6	10.7	10.8
Number of Children 0 - 1.5	*Coef*	-306	-472	29	-551	-595
	t-st	-0.4	-0.6	0.0	-0.7	-0.7
Number of Children 1.6 - 6	*Coef*	-1444	-1606	-1317	-1555	-1669
	t-st	-3.2	-3.5	-1.3	-3.4	-3.6
Number of Children 6 - 16	*Coef*	-788	-924	-1204	-980	-1066
	t-st	-3.3	-3.5	-1.9	-3.8	-3.9
Number of Old-Age Pensioners	*Coef*		-674	-936	-511	
	t-st		-3.1	-2.0	-1.8	
Number of Disability Pensioners	*Coef*		-752	-1490	-798	
	t-st		-2.3	-1.5	-2.3	
Number of Loss of Provider Pensioners	*Coef*		-727	-586	-990	
	t-st		-2.0	-0.6	-2.7	
Number of Military Pensioners	*Coef*		-255	-941	-495	
	t-st		-0.6	-0.8	-1.1	
Number of Males 50+	*Coef*				280	-212
	t-st				0.8	-0.8
Number of Females 50+	*Coef*				-499	-709
	t-st				-1.7	-3.0
HH: Age	*Coef*	-1.6	-1	0	-1	-1
	t-st	-2.3	-1.8	0.2	-1.4	-1.5
HH: Male	*Coef*	1051	1164	1921	1201	950
	t-st	4.3	4.4	2.9	4.2	3.1
HH: Grade completed in Secondary School	*Coef*	75	61	141	72	67
	t-st	1.7	1.4	1.3	1.7	1.6
HH: Vocational Diploma	*Coef*	461	451	207	504	469
	t-st	2.2	2.2	0.4	2.4	2.2
HH: Profess-Tech Diploma w/o Secondary Degree	*Coef*	146	141	71	729	143
	t-st	0.4	0.4	0.1	3.1	0.4
HH: Profess-Tech Diploma with Secondary Degree	*Coef*	310	282	-233	269	264
	t-st	1.2	1.1	-0.3	1.0	1.0
HH: University Diploma	*Coef*	1578	1560	2902	1593	1561
	t-st	5.9	5.9	3.6	6.0	5.9
HH: Graduate Diploma	*Coef*	559	545	-1359	584	523
	t-st	0.4	0.4	-0.6	0.4	0.4
F-statistics for # of Pensioners (Stat/Signif)			4.4/.00	1.0/.4	2.0/.1	
F-statistics for # of Male & Females 50+ (Stat/Signif)					3.1/.05	4.5/.01
Number of Observations		5065	5065	752	5065	5065

Notes: The dependent variable is household expenditures. The sample is restricted to households eligible for pensions. All regressions include indicator variables for geographical regions and rounds. HH refer to household head.

Table 5.7: Estimates of the propensity to consume from pensions and other income

				Level *Pens>=0* (1)	First Diff *Pens>=0* (2)	Level *Pens>0* (3)	First Diff *Pens>0* (4)
Pension	(1)	*OLS*	*Coef*	0.49	0.63	0.48	0.52
			t-st	7.4	7.8	4.2	3.8
	(2)	*IV*	*Coef*	0.56	0.89	0.49	0.91
			t-st	4.4	5.5	2.8	4.1
Pension/Other Income	(3)	*OLS*	*Coef*	.53/.52	.58/.40	.61/.52	.53/.40
			t-st	10.0/19.5	7.8/13.1	6.9/17.6	4.1/11.4
	(4)	*IVCash*	*Coef*	.52/.36	.60/.21	.57/.37	.53/.22
			t-st	9.5/12.5	7.9/8.2	6.2/11.6	4.0/7.3
	(5)	*3SLS*	*Coef*	.74/.52	.83/.34	.71/.56	.83/.48
			t-st	7.8/11.7	8.9/6.9	6.3/10.9	6.6/8.7
F- or Ch2-Tests on Equality of Pension and Other Income Coefficients (Stat/Signif)							
	(3)	*OLS*		0.1/.83	4.6/.00	0.7/.40	0.9/.34
	(4)	*IVCash*		5.4/.02	18.8/.00	3.6/.06	4.8/.00
	(5)	*3SLS*		5.3/.02	20.4/.00	6.4/.00	6.0/.00
F- or Ch2-Tests on Significance of Instruments (Stat/Signif)							
	(2)	*Pension*		121/.00	54/.00	156/.00	116/.00
	(4)	*Inccash*		8750/.00	2716/.00	7814/.00	4199/.00
	(5)	*Pension*		3103/.00	2117/.00	1893/.00	2750/.00
	(5)	*Income*		266/.00	258/.00	269/.00	258/.00
Number of Observations				5065	4905	4313	4115

Notes: The dependent variable is household expenditures. The sample of the first two columns is restricted to all households eligible for pensions, and the in last two columns to all households which received pensions payments. The estimates in columns 1 and 3 are for level regressions, and the coefficients in columns 2 and 4 for regressions in first-differences. All regressions contain the variables used in the regression of Column 4 in Table 5.6. In Row 2, pensions are instrumented on an indicator variables for whether the head has ever worked, the year of the head's last employment, the head's occupational code for 1985 and 1991, the numbers of pensioners by type, the first nine cluster- and oblast-level variables listed in Table 5.3, and the average level of pension entitlements by oblast. In Row 4, other income is instrumented on other income excluding home production ("Inccash"). In Row 5, pensions are instrumented on the same variables as in Row 2. Other income is instrumented on indicators for whether the household head participates in the labour force, has a job, has wage arrears, and on the occupational code for the primary and secondary jobs of the household head.

and endogeneity issues related to other income, the estimates are likely to be inconsistent. When other income is instrumented by other income excluding home production, the coefficient on pensions remains unchanged. The estimate on other income drops by almost one third, and the F-test rejects equality of the two coefficients at the 3 percent level. The result is confirmed when both pensions and other income are instrumented with the set of instruments of Row 2 for pensions and labour market characteristics of the household head for income. The 3SLS estimates in Row 5 show that the coefficient for both pensions and income increase. The gap between the coefficients widens and the F-statistic rejects equality. It is interesting to compare the coefficients for pensions in rows 1 and 2 with those in rows 3 and 5. Controlling for income has little impact on the coefficient for pensions for the OLS estimates, but leads to a higher pension estimate in the 3SLS regression. This rise in the pension coefficient is consistent with the view that endogenous responses are important.

Column 2 presents the corresponding results of the fixed effects regression. The consistency of these estimates is not affected by the omission of time-invariant factors. The differences in the propensities to consume are larger than for the OLS estimates. The estimates on pensions are higher, and those on other income smaller. Once instrumented, the coefficient for pensions is not significantly different from unity, which is consistent with an interpretation that pensions are like permanent income. The F-tests reject equality of the coefficients on pensions and other income in all cases. However, the 3SLS estimate on pensions in Row 5 is now lower than the coefficient in Row 2, in contrast to the pattern from the cross-sectional estimates.

The last two columns investigate whether the main results survive once attention is restricted to the group of households actually receiving transfers. If sample selection is a major issue, one would expect these coefficients to deviate from the estimates obtained from the whole sample of eligible households. As there is no need to control for the regional variation in the probability of pension arrears, the cluster and oblast-level variables are dropped from the set of instruments for pension payments. Columns 3 and 4 of Table 5.7 display the coefficients on pensions and income variables for the

OLS, IV, and 3SLS estimations on the subsample of benefit recipients. The coefficients display the same pattern as the corresponding estimates from Column 1. While the point estimates deviate somewhat, the differences to the estimates from the level regressions are not statistically significant. The F-statistics still reject the equality of the coefficients at the 10 percent level in Row 4 and Row 5.

5.2.3 Child Benefits

The System of Child Benefits

The current system of child benefits was introduced in 1991. Families are eligible for child benefits for each child under the age of 16, or under the age of 18 for students. The size of child benefits is linked to the minimum wage which is determined by the Russian Parliament, the Duma. Child benefits vary by age group, and are higher for single parents and families of serving soldiers (Table 5.1).[13] In early 1994, the government moved the financing responsibility from the federal to regional budgets. In early 1998, the delivery of child benefits was transferred from the place of employment to local social welfare offices.[14] Budget expenditures on monthly child benefit payments varied around 0.7 percent of GDP between 1994 to 1997. Child benefits are typically paid to the mother but parents have the right to choose the entitled person as long as both parents live with the child. In July 1998, child benefits became means-tested, restricting eligibility to families with average per capita income no more than twice the minimum subsistence level, but most regions delayed the implementation of these rules until 1999 (Klugman and Motivans 1999).[15]

[13]Child benefits are not adjusted for regional price differences.

[14]Unemployed eligible parents were even before 1998 paid by the local social protection office.

[15]Only 5 percent of the families eligible for child benefits in Round 7 and with children below the age of 15 stated that they are no longer eligible for child benefits in Round 8.

Child Benefit Arrears

The difficulties of the government to collect revenues caused grave funding problems for child benefits. According to regional budgetary data from 1996, actual spending on child benefits fell 28 percent short of plan. The RLMS provides information about the eligibility status for child benefits of families with children, and the amounts eligible families received as child benefits in the 30 days preceding the interview. Analogous to the analysis of pensions, arrears of child benefits are defined as non-payment of child benefits over the last month. Amongst the families that received child benefits the reported payments match closely to the amounts calculated on the basis of eligibility and benefit rules. The overall gap between reported and calculated payments as a percent of reported payments is close to zero in all rounds. Reported payments tend to be higher for families with children under the age of 1.5 years, possibly due to the inclusion of other official cash transfers, like maternity benefits or parental leave benefits.[16]

Child benefit arrears affected already one third of eligible families in 1994, and the share increased in each round to reach 80 percent in 1998 (Table 5.1). What determines the pattern of arrears in child benefits? In contrast to the pension system, child benefits are financed at the regional level without any redistribution of resources at the federal level. The variation in child benefit arrears at the local level grew from year to year (Table 5.8).[17] By 1998, no more than 15 percent of eligible families received child benefits anywhere outside Moscow and St. Petersburg. Regions differ widely in fiscal resources, and the large variation in child benefit arrears across regions mirrors these fiscal inequalities even more than for pensions (Table 5.3). At the state level, arrears are likely to be determined by the gap in planned and actual spending on child benefits. While data on actual spending on child benefits is available, I lack information on child

[16]In 1998, maternity benefits and payments for parental leave accounted for 10 percent of the spending on public cash transfer programmes to families with children according to budget plan (Kuprianova 1998).

[17]The coefficient of variation across PSUs grew from 0.21 in Round 5 to 1.1 in Round 8. The coefficient of variation across clusters rose frm 0.28 in Round 5 to 1.3 in Round 8.

benefit by plan. This variable is proxied with per-capita federal transfers, regional output (GRP), and the number of children. An indicator variable for welfare offices is also added. Unsurprisingly, child benefit arrears were lower in regions with higher spending on family support, higher federal transfers, higher GRP, and with welfare offices. The incidence of arrears is lower in regions with more children.

Table 5.8: Regional incidence of child benefit receipt

		Transfer Receipt as % of Entitlement			
		1994	1995	1996	1998
Overall					
	%	66	55	38	20
	SE	2	2	3	2
Settlement Type					
Urban	%	66	62	44	23
	SE	3	3	4	3
Suburban Settlement	%	73	51	47	15
	SE	7	8	3	7
Rural	%	64	40	21	15
	SE	3	3	3	3
Geographical Regions					
Metropolitan	%	71	67	76	84
	SE	2	2	5	1
Northern and North Western	%	50	39	34	7
	SE	6	8	9	2
Central and Central Black-Earth	%	75	71	51	20
	SE	7	6	11	5
Volga-Vaytski and Volga Basin	%	72	53	39	7
	SE	5	6	4	2
North Caucasian	%	65	52	29	20
	SE	3	4	4	7
Ural	%	64	61	31	17
	SE	4	3	7	4
Western Siberian	%	64	44	40	12
	SE	4	9	6	3
Eastern Siberian and Far Eastern	%	59	42	12	15
	SE	4	4	2	4

Notes: The sample contains households eligible for child benefits. The numbers show the means and standard errors of child benefit receipt during the last 30 days.

Table 5.9 provides summary statistics for household characteristics, separating families by the status of child benefit arrears. Households not receiving child benefits were more likely to live in rural areas, spent less and have lower income than households that were

paid. There are no systematic differences in characteristics of the household head.

The determinants of child benefit receipts are examined closer in Table 5.10. Column 1 shows the probit estimates of the receipt of child benefits for eligible households on household income excluding child benefits controlling for household composition; age, gender, marital status and educational attainment of the household head; and indicator variables for each round. Income is significant at the 1 percent level, and the educational variables are jointly significant at the 10 percent level. When regional spending variations on child benefits are controlled for using the four variables listed in Table 5.3 and indicator variables of whether other household members incurred wage arrears are added, both income and education become insignificant.

The next regression adds potential child benefits as explanatory variable, calculated according to the nation-wide benefit rules. It is significant at the 10 percent but has a negative sign, and income and education remain insignificant. Column 4 and Column 5 look at the impact of correcting for measurement error in household income. The same instruments for income are used as in the corresponding regression for pension receipts. Income and education are still insignificant. Column 6 includes an indicator variable for arrears in previous rounds. It is highly significant, and negative. Again, income and education remain insignificant at the 10 percent level. The conclusion of this analysis mirrors the results from the investigation of pension arrears. There is little evidence that observable characteristics like income or education matter for the receipt of child benefits, but the correlation of past and current arrears of child benefits could indicate that some families are better at collecting child benefits than others.

Identification

The estimation of the propensity to consume from child benefits is less straightforward than for pensions. First of all, child benefits are a much smaller part of household income than pensions. Even for families with children with child benefit arrears, they represented

Table 5.9: Household characteristics by child benefit arrears status

		No Arrears	Arrears
		(1)	(2)
Houshold Members	#	4.3	4.3
	SE	0.1	0.1
Children under 1.5 years	#	0.1	0.1
	SE	0.0	0.0
Children 1.5 to 6 years	#	0.5	0.5
	SE	0.0	0.0
Children 6 to 16 years	#	1.6	1.6
	SE	0.0	0.0
Pensioners	#	0.4	0.4
	SE	0.0	0.0
Expenditure	*R*	11443	10898
	SE	544	642
Income	*R*	9065	8016
	SE	398	443
Assets	#	3.9	4.0
	SE	0.1	0.1
HH: Male	%	88.0	89.8
	SE	0.0	0.0
HH: Age	*months*	459	460
	SE	4	4
HH: Married?	%	88.0	87.0
	SE	1.0	1.0
HH: High School?	%	84.0	82.0
	SE	1.5	1.5
HH: Gradre?	*mean*	9.5	9.5
	SE	0.0	0.0
HH: Studied after School?	%	86.0	88.0
	SE	1.3	1.1
If Studied after School:			
HH: Vocational Diploma?	%	35.2	37.8
	SE	2.2	2.3
HH: Profess-Tech Diploma w/o Secondary Degree?	%	13.5	13.4
	SE	1.0	1.1
HH: Profess-Tech Diploma with Secondary Degree?	%	26.1	24.8
	SE	1.7	1.4
HH: Technical-Medical Diploma?	%	24.0	23.0
	SE	2.0	2.0
HH: University Diploma?	%	20.0	18.0
	SE	2.2	1.7
HH: Graduate Diploma?	%	0.5	0.5
	SE	0.3	0.2
HH: Labour Force?	%	93.0	92.0
	SE	0.6	0.8
If in Labour Force:			
HH: Has Job?	%	94.0	93.0
	SE	0.7	0.8

Notes: The sample contains households eligible for child benefits. The numbers show the means and standard errors of personal and household characteristics for households with and with child benefit arrears. HH refers to household head.

Table 5.10: Determinants of the probability to receive child benefits

		Probit (1)	Probit (2)	Probit (3)	OLS (4)	IV (5)	Probit (6)
Income Excluding Child Benefits	*Coef*	1E-05	5E-06	4E-06	2E-06	4E-06	6E-06
	t-st	3.2	1.4	1.4	1.6	1.0	1.6
Potential Child Benefits	*Coef*			-1E-06			
	t-st			-1.7			
Child Benefit Arrears, t-1	*Coef*						-0.37
	t-st						-6.1
F-TESTS (Stat/Signif)							
Education		1.9/.08	1.5/.18	1.5/.18	1.4/.24	1.3/.26	0.94/.47
Cluster and Oblast level variables			12.6/.00	12.7/.00	16.1/.00	12.5/.00	9.8/.00
Income IV						39.1/.00	
Numbers of Pensioners			4.4/.00		1.0/.4		
Numbers of Male 50+ and Females 50+							4.5/.01
Number of Observations		3427	3427	3427	3427	3427	2538

Notes: The dependent variable is child benefit receipt. The sample is restricted to households eligible for child benefits. All regressions include indicator variables for rounds and geographical regions, and the variables household size, numbers of children by age group, and numbers of old-age males and females. The education variables refer to the household head and are grade level completed in secondary school, vocational diploma, professional-technical diploma without secondary degree, professional-technical diploma with secondary degree, university diploma, and graduate diploma. The cluster- and oblast-level variables in columns 2 to 6 are the variables listed in Table 5.3. Columns 2 to 6 also contain the head's spouse employment status and wage arrears status. Income excluding pensions is instrumented in Column 4 on indicators or whether the household head participates in the labour force, has a job, has wage arrears, and on the occupational code for the primary and secondary jobs of the household head.

at their peak in 1996 just 15 percent of expenditures and 7 percent of the poverty line. The largest part of the variation in household expenditures is due to variations in other income components or changes in tastes and needs, rather than fluctuations in child benefits. Second, the identification problem encountered for pensions is present again and even more difficult to deal with. Child benefits are a direct function of the number of children in a household. In contrast to pensions, they are fully formula driven, and do not depend on any personal characteristics of household members. Yet, at the same time, the number of children has a direct influence on the expenditure pattern of the household. In effect, there are no adequate instruments for child benefits, as it is difficult to exclude the number of children from the regression.

The identification problem is illustrated by the following regressions. Table 5.11 shows OLS regression for eligible families of household expenditures on child benefits and the set of covariates used in the probit regressions of Table 5.10. Column 1 does exclude the number of children by age-group in the regression. The coefficient on

Table 5.11: OLS regressions of household expenditures on child benefits and covariates

		(1)	(2)	(3)	(4)
Child Benefits	*Coef*	0.45	0.74		0.68
	t-st	1.5	2.5		2.3
Household Size	*Coef*	1053	1899	1892	2160
	t-st	5.1	6.9	6.0	6.9
Number of Children 0 - 1.5	*Coef*		-1204	-234	
	t-st		-2.1	-0.3	
Number of Children 1.6 - 6	*Coef*		-1699	-1406	
	t-st		-4.0	-2.8	
Number of Children 6 - 16	*Coef*		-1574	-1226	
	t-st		-5.5	-3.6	
Number of Boys 0 - 4	*Coef*				-2029
	t-st				-3.5
Number of Girls 0 - 4	*Coef*				-1647
	t-st				-3.0
Number of Male Children 4 - 21	*Coef*				-1302
	t-st				-3.4
Number of Female Children 4 - 21	*Coef*				-1701
	t-st				-4.8
Number of Males 50+	*Coef*	559	-94	52	-265
	t-st	1.0	-0.2	0.1	-0.5
Number of Females 50+	*Coef*	21	-777	-895	-1031
	t-st	0.1	-2.0	-1.7	-2.3
HH: Age	*Coef*	4	2	1	3.0
	t-st	2.5	1.5	0.5	1.9
HH: Male	*Coef*	2185	1447	1715	1298
	t-st	5.0	3.2	3.5	2.6
HH: Grade completed in Secondary School	*Coef*	393	380	335	348
	t-st	3.3	3.1	2.3	2.8
HH: Vocational Diploma	*Coef*	431	460	547	413
	t-st	1.2	1.3	1.2	1.1
HH: Profess-Tech Diploma w/o Secondary Degree	*Coef*	-153	-82.2	62	-63
	t-st	-0.3	-0.2	0.1	-0.1
HH: Profess-Tech Diploma with Secondary Degree	*Coef*	-554	-462	-175	-584
	t-st	-1.5	-1.3	-0.4	-1.6
HH: University Diploma	*Coef*	1975	2070	2378	1973
	t-st	5.6	5.7	4.5	5.7
HH: Graduate Diploma	*Coef*	2612	2879	4457	2638
	t-st	1.3	1.4	1.5	1.2
F-statistics for # of Children 0 - 16 (Stat/Sign)			10.2/.00	5.1/.00	
F-statistics for # of Boys & Girls 0 - 4, 4 - 21 (Stat/Sign)					6.1/.00
Number of Observations		3414	3414	1554	3414

Notes: The dependent variable is household expenditures. The sample is restricted to households eligible for child benefits. All regressions include indicator variables for geographical regions and rounds.
HH refers to household head.

child benefits equals 0.33, and is measured imprecisely. In the next regression, the numbers of children by age group is added. The estimate for child benefits increases to 0.61, and is significant at the 10 percent level. The child demographic variables are individually and jointly significant, as shown by the t- and F-statistics, and have negative coefficients. Are the children variables simply significant due to their collinearity with child benefits, or has the presence of children a different impact on household expenditures than the presence of adults? Column restricts the sample to households with children that incurred arrears in child benefits. Again, the numbers of children are individually and jointly significant. Unsurprisingly, the implication is that it is necessary to control directly for the number of children in a household. Column 4 presents the basic specification. As child benefits are included as regressor, the age-group categories that enter the benefit rules are not used. Instead, I choose different age groups (the numbers of boys and girls under the 4 years of age, and the numbers of male and female children between 4 to 21 years of age) and exploit that child benefits do not vary between boys and girls.

Estimation

The coefficients for the income variables for the basic specification are shown in Column 1 of Table 5.12. I follow the same procedure as for pensions, but do not instrument for child benefits.[18] The regressions control for the numbers of children by age category and gender, the numbers of male and female persons at the age 50 or over, and age, gender, and educational attainment of the household head.

The coefficient on child benefits in the basic specification equals 0.68, estimated significantly at the 3 percent level. Once income excluding child benefits is added, the estimate drops to 0.29, and the coefficient on other income equals 0.44. The t-statistics indicate that only the estimate for other income is measured significantly. An F-test cannot reject the equality of the two estimates. Instrumenting other income by other income excluding household production re-

[18]Matching the approach for pensions, we restrict attention on eligible families. The qualitative results are unchanged if non-eligible households with children are included.

Table 5.12: Estimates of the propensity to consume from child benefits and other income

				Level *ChBen>=0* (1)	First-Diff *ChBen>=0* (2)	Level *ChBen>0* (3)	First-Diff *ChBen>0* (4)
Child Benefits	(1)	*OLS*	*Coef*	0.68	0.38	0.49	-0.46
			t-st	2.3	1.7	1.1	-1.0
Child Benefits/Other Income	(2)	*OLS*	*Coef*	.29/.44	.23/.29	.17/.44	-.56/.25
			t-st	1.2/15.4	1.2/9.3	.42/13.5	-1.3/7.1
	(3)	*IVCash*	*Coef*	.35/.38	.29/.18	.18/.43	-.53/.18
			t-st	1.4/12.3	1.4/5.5	.5/11.8	-1.2/4.7
F-Tests on Equality of Child Benefit and Other Income Coefficients (Stat/Signif)							
	(2)	*OLS*		0.3/.58	0.2/.63	0.5/.51	3.5/.07
	(3)	*IVCash*		0.0/.92	0.0/.91	0.4/.53	2.6/.11
F-Tests/Ch2-Tests on Significance of Instruments (Stat/Signif)							
	(3)	*Inccash*		11652/.00	5534/.00	9506/.00	5466/.00
Number of Observations				3414	3304	1554	1196

Notes: The dependent variable is household expenditures. The sample in the first two columns is restricted to all households eligible for child benefits, and in last two columns to all households which received child benefit payments. The estimates in columns 1 and 3 are for level regressions, and the coefficients in columns 2 and 4 for regressions in first-differences. All regressions contain the variables used in the regression of Column 4 in Table 5.11. In Row 3, other income is instrumented on other income excluding home production ("Inccash").

duces the gap between the estimates further. The point estimate for

5.2.4 Sensitivity Analysis

The regressions of Table 5.7 and Table 5.12 suggest three regularities. First, the analysis confirms that the propensity to consume from transitory income components is higher than from permanent income components. This distinction is especially relevant in Russia, where households were exposed to large income variations. Second, the estimate for pensions is higher than for other forms of income received by pensioner households. Third, there is no evidence that the propensity to consume from child benefits differs from the one from other income in households with children.

The higher coefficient on pensions may seem surprising in view of the large incidence of pension arrears. However, pensions were still a more regular source of receipts than other incomes. Both wages and child benefits were subject to even greater and more persistent payment problems than pensions. The average incidence of wage arrears according to the RLMS between 1994 and 1998 was 25 percent, and in all rounds at least one fifth of the work force incurred wage arrears. Furthermore, over half of the households with pensioners are one-generational, and less than one quarter of the pensioners live with children. As the discount rate of households with pensioners is likely to be higher than the discount rate of households with children, pensions are closer to a notion of permanent income for pension households than similar income in households with children. Finally, the coefficient on pensions is generally less than unity, even when it is instrumented in order to capture the regular part in the pension payments. This section investigates the robustness of some of these results. I address the issue of lacking instruments for child benefits, consider the impact of changes in household types, and look at food expenditures only.

The regressions on child benefits did not instrument for child benefits due to identification problems. Table 5.13 imposes that the propensity to consume is identical for both cash transfers and other incomes, and instruments for total income using the full set of instruments for cash benefits and other income. It shows the coefficients from the regressions on the samples of eligible households. Row 1 gives the simple OLS estimate for levels and first-differences, and

Row 2 shows the coefficient using income excluding home production as instrument. The estimates are similar to the coefficients on other income of the corresponding regressions in Table 5.7 and Table 5.12, as other income represents the main part of household income. Row 3 presents the estimate from the full instrumentation of total income. The pattern is unchanged. Pensioner households have a larger propensity to consume than families with children due to the higher share of pension income.

Table 5.13: Estimates of the propensity to consume from total income

				Level		First-Differences	
				Pens>=0	*ChBen>=0*	*Pens>=0*	*ChBen>=0*
				(1)	(2)	(3)	(4)
Household Expenditures	(1)	*OLS*	*Coef*	0.52	0.44	0.41	0.29
			t-st	20.9	15.9	14.7	9.5
	(2)	*IVCash*	*Coef*	0.37	0.37	0.26	0.18
			t-st	14.5	12.6	11.5	5.7
	(3)	*IV*	*Coef*	0.55	0.47	0.47	0.33
			t-st	10.4	8.9	7.6	5.8
Food Expenditures	(4)	*OLS*	*Coef*	0.42	0.28	0.35	0.22
			t-st	17	12.8	12.9	9.4
	(5)	*IVCash*	*Coef*	0.22	0.18	0.17	0.09
			t-st	11.1	9.7	8.9	5.5
	(6)	*IV*	*Coef*	0.51	0.31	0.49	0.29
			t-st	10.4	6.3	8.9	5.1
F-Tests on Significance of Instruments for total income (Stat/Signif)							
	(2) (5)	*Inccash*		7909/.00	11747/.00	2956/.00	4788.8
	(3) (6)	*Income*		12.5/.00	21.8	17.2/.00	20.5/.00
Number of Observations				5065	3414	4313	1196

Notes: The dependent variable in rows 1 to 3 is household expenditures, and in rows 4 to 6 food expenditures. The estimates in columns 1 and 2 are for level regressions, and the coefficients in columns 3 and 4 for first-differences regressions. The sample in the first and third columns is restricted to all households eligible for pensions, and in the second and fourth columns to all households eligible for child benefits. The regressions in columns 1 and 3 contain the variables used in the regression of Column 4 in Table 5.6, and total income is instrumented in Row 2 and Row 5 on income excluding pensions and home production ("Inccash"), and in Row 3 and Row 6 on the instruments for pensions and other income of the 3SLS regression in Row 5 of Table 5.7. The regression in columns 2 and 4 contain the variables used in the regression of Column 4 in Table 5.11, and total income is instrumented in Row 2 and Row 5 on income excluding child benefits and home production ("Inccash"), and in Row 3 and Row 6 on indicators for whether the household head

two household types are even larger than before.

If the variables on household composition do not fully capture the differences in household types, then the estimates of the propensity to consume may partly reflect the variation in household composition across household types. Household composition remains constant if households that are both eligible for pensions and child benefits are considered. Table 5.14 shows the OLS estimates of the propensities to consume for this subsample. The point estimate on pensions is at least twice as large as the one for child benefits, and up to twice as large for other income, while the coefficients for child benefits and other income are fairly close. However, the coefficients on child benefits are measured with a large standard error, and the F-statistics cannot reject the equality of the estimates for pensions and child benefits. The estimates for spending on food expenditures display the same pattern, and once again the differences in the coefficients are larger.

5.3 Poverty Decomposition

5.3.1 Methodology

Poverty rose from 12.4 percent in 1994 to 33 percent in 1998 (Table 5.1). This section aims to quantify the impact of the changes in cash transfers on poverty. It extends an existing decomposition technique in order to identify the impact of changes in separate expenditure components on poverty (Ravallion and Datt 1991). The change in the welfare ratio is attributed to two components: the change due to variations in government cash transfers (T), and the change due to variations in expenditures excluding government cash transfers (E). T is defined as the ratio of cash transfers to the poverty line, and E as the ratio of expenditures excluding cash transfers to the poverty line. The distribution of expenditures excluding cash transfers is calculated using the propensities to consume calculated for pensions and child benefits. Household composition is assumed to remain unchanged over the period.

Table 5.14: Estimates of the propensity to consume for households receiving both pensions and child benefits

Household Expenditures				
Pensions/Child Benefits/Other Income	(1)	*OLS*	*Coef*	.81/.41/.54
			t-st	4.6/1.1/11.9
	(2)	*IVCash*	*Coef*	.86/.38/.43
Food Expenditures			*t-st*	5.0/1.0/7.1
Pensions/Child Benefits/Other Income	(3)	*OLS*	*Coef*	.65/.21/.38
			t-st	4.7/.6/9.6
	(4)	*IVCash*	*Coef*	.74/.17/.21
			t-st	5.1/.5/4.7
Household Expenditures: F-statistics on Equality of Coefficients (Stat/Signif)				
Pensions/Child Benefits	(1)	*OLS*		0.9/.34
	(2)	*IVCash*		1.4/.24
Pensions/Other Income	(1)	*OLS*		2.3/.13
	(2)	*IVCash*		3.2/.08
Child Benefits/Other Income	(1)	*OLS*		0.1/.72
	(2)	*IVCash*		0.3/.60
Food Expenditures: F-statistics on Equality of Coefficients (Stat/Signif)				
Pensions/Child Benefits	(3)	*OLS*		1.3/.25
	(4)	*IVCash*		2.4/.13
Pensions/Other Income	(3)	*OLS*		6.1/.02
	(4)	*IVCash*		11.3/.00
Child Benefits/Other Income	(3)	*OLS*		0.0/.90
	(4)	*IVCash*		0.0/.90
F-statistics on Instrument (Stat/Signif)	(2)	*Inccash*		1831/.00
Number of Observations				1049

Notes: The dependent variable in Row 1 and Row 2 is household expenditures, and in Row 3 and Row 4 food expenditures. The estimates in rows 1 and 3 are for OLS regressions, and in rows 2 and 4 for instrumental variables regressions, where income excluding pensions and child benefits is instrumented on income excluding pensions, child benefits, and home production. The sample is restricted to all households eligible for both pensions and child benefits. All regressions contain the variables used in the regression of Column 4 in Table 5.11.

Let poverty be measured by a function of the type

$$P_t = P(\mu_t, D_t) \tag{5.1}$$

where μ_t is the mean level of the welfare ratio, and D_t is the mean normalised distribution function of the welfare ratio at date t.[19] Then

$$D_t = D_t^E + D_t^T$$

and

$$\mu_t = \mu_t^E + \mu_t^T$$

where superscripts E and T are defined as above. Using t as reference period, the change in poverty rates between date t and $t+1$ can be decomposed into the following components:

$$P_{t+1} - P_t = \underbrace{P_{t+1}^T - P_t}_{T\text{-Effect}} + \underbrace{P_{t+1}^E - P_t}_{E\text{-Effect}} + \underbrace{P_{t+1} - P_{t+1}^T - P_{t+1}^E + P_t}_{\text{Residual effect}} \tag{5.2}$$

where

$$P_{t+1}^T = P(\mu_t^E + \mu_{t+1}^T, D_t^E + D_{t+1}^T)$$

and

$$P_{t+1}^E = P(\mu_{t+1}^E + \mu_t^T, D_{t+1}^E + D_t^T).$$

The T-effect is defined as the change in poverty rates due to the change in transfers ($\mu_{t+1}^T \neq \mu_t^T, D_{t+1}^T \neq D_t^T, \mu_{t+1}^E = \mu_t^E, D_{t+1}^E = D_t^E$), and the E-effect equals the change in poverty due to the change in expenditures excluding cash transfers ($\mu_{t+1}^T = \mu_t^T, D_{t+1}^T = D_t^T, \mu_{t+1}^E \neq \mu_t^E, D_{t+1}^E \neq D_t^E$). The residual measures the change in poverty not accounted for by those two effects. It is in general unequal to zero since poverty measures are not additively separable into expenditure components. Consider a pensioner household with expenditures of

[19] Equation 5.1 indicates that the decomposition applies only to poverty measures which can be fully characterised in terms of the mean level of the welfare ratio, and the mean normalised distribution function. The three members of the FGT class of poverty measures used in the analysis satisfy this condition.

R10 above the poverty line, and assume an uniform propensity to consume of unity. If pensions drop by less than R10, and nothing else changes, then the poverty indices remain unaffected. Equally, if other income falls less by R10, then poverty remains the same under the ceteris paribus condition. However, if both pensions and other income drop by R10, then poverty will increase. The residual effect is larger for poverty indices that are more sensitive to distribution of expenditures among the poor, as the separate and joint impacts of changes in expenditure components differ more. The residual has a natural interpretation, as it equals the effect of a change in the reference date on the decomposition.[20] A standard procedure to eliminate the residual is to average the changes over the reference dates t and $t+1$.

It is interesting to quantify the relative contribution of growth and redistribution effects of changes in government transfers to the changes in poverty rates. Following Ravallion and Datt (1991), the decomposition for transfers is defined as[21]

$$P^T_{t+1} - P_t = \underbrace{P^{TG}_{t+1} - P_t}_{\text{Transfer growth effect}} + \underbrace{P^{TR}_{t+1} - P_t}_{\text{Transfer redistribution effect}} + \underbrace{P^T_{t+1} - P^{TG}_{t+1} - P^{TR}_{t+1} + P_t}_{\text{Transfer residual effect}} \quad (5.3)$$

where

$$P^{TG}_{t+1} = P(\mu^E_t + \mu^T_{t+1}, D_t)$$

and

$$P^{TR}_{t+1} = P(\mu_t, D^E_t + D^T_{t+1}).$$

Taking t as reference date, the transfer growth (redistribution) effect equals the change in P_t due to the change $\mu^T_{t+1} - \mu^T_t$ $(D^T_{t+1} - D^T_t)$

[20]For example, the T-effect with reference period $t+1$ is $P_{t+1} - P(\mu^E_{t+1} + \mu^T_t, D^E_{t+1} + D^T_t) = P_{t+1} - P^E_{t+1}$, or the sum of the T- and residual effects with reference period t.

[21]The decomposition for pre-government transfer expenditures E is determined accordingly.

while keeping μ_t^E and D_t (D_t^E and μ_t) constant. The transfer residual measures the change in poverty not accounted for by growth and redistribution components. It is unequal to zero whenever the changes in poverty due to changes in μ_t depend on the shape of the distribution function, and vice versa. In contrast to the residual effect in Equation 5.2, the transfer residual is not equal to changes in growth and redistribution effects due to the switching of reference periods.[22] The decomposition in growth and redistribution effects needs to be calculated separately for each relevant reference period.

The poverty rates for the decompositions are calculated using constructed distributions of welfare ratios for the panel of households represented in all four rounds. For example, the poverty rate $P_7^{TR} = P(\mu_5, D_5^E + D_7^T)$ is based on the welfare ratio obtained by dividing transfers in Round 7 by their mean, multiplying them with the mean transfer level in Round 5, and adding to them pre-government transfer expenditures from Round 5.

5.3.2 Results

What is the contribution of the changes in the government transfers to the rise in poverty rates from 1994 to 1998? The results are shown for both the level and fixed effects estimates of the propensities to consume. The regressions suggest that these sets of coefficients cover the range of possible propensities to consume from cash transfers. I use as propensities to consume from pensions the IV estimates for the case without other income (0.56 for OLS and 0.89 for fixed effects from Table 5.7). There are no corresponding estimates for child benefits, as child benefits could not be instrumented. Since there is no evidence that the propensity to consume from child benefits deviates from the one from other income, I take as coefficients the IV estimates from the regressions on total income (0.47 for OLS and 0.33 for fixed effects from Table 5.12). In any case, they are consistent with the range of OLS estimates in Row 1 of Table 5.15. These coefficients are also used for other government cash transfers

[22] For example, the transfer growth effect with reference period $t+1$ equals $P_{t+1} - P(\mu_t^T + \mu_{t+1}^E, D_{t+1})$, which is unequal to the sum of transfer growth and transfer residual effects with reference period t $P_{t+1}^T - P_{t+1}^{TR}$.

Table 5.15: Decomposition of changes in poverty

Propensity to consume:	**Pen 0.89**	**ChBen 0.33**	**Pen 0.56**	**ChBen 0.47**
	abs	*%*	*abs*	*%*
	(1)	(2)	(3)	(4)
Head-count				
Actual	20.6		20.6	
Changes in transfers	4.1	20	2.9	14
Growth	4.3	21	2.9	14
Redistribution	0.4	2	0.3	1
Rest	-0.6	-3	-0.3	-1
Changes in expenditures	16.5	80	17.7	86
Growth	15.9	77	17.9	87
Redistribution	0.2	1	-0.7	-3
Rest	0.3	1	0.5	2
Poverty gap				
Actual	7.2		7.2	
Changes in transfers	2.4	33	1.7	24
Growth	2.1	29	1.4	19
Redistribution	0.5	7	0.4	6
Rest	-0.2	-3	-0.1	-1
Changes in expenditures	4.8	67	5.5	76
Growth	5.1	71	5.9	82
Redistribution	-0.3	-4	-0.4	-6
Rest	-0.1	-1	0.0	0
FGT				
Actual	3.5		3.5	
Changes in transfers	2.4	69	1.2	34
Growth	1.4	40	0.9	26
Redistribution	0.9	26	0.4	11
Rest	0.0	0	-0.1	-3
Changes in expenditures	1.1	31	2.3	66
Growth	2.1	60	2.7	77
Redistribution	-0.3	-9	-0.3	-9
Rest	-0.7	-20	-0.2	-6

Notes: The changes in poverty between 1994 and 1998 are decomposed according to Equation 5.2 and Equation 5.3 in the text. The residual effect is eliminated by averaging over 1994 and 1998.

(unemployment benefits, apartment benefits, and fuel benefits).

The decomposition results for the changes from 1994 to 1998 are shown in Table 5.15, averaged over the reference dates 1994 and 1998. The changes in government transfers increase poverty according to all poverty statistics for both the OLS or fixed effects estimates. The quantitative effects vary by poverty statistic and reference period, but at least 14 percent of the rise in poverty was due to the changes in cash transfer policy. Both the transfer growth and transfer distribution effects increase poverty unambiguously. The transfer growth effect accounts for at least 60 percent of the change.[23]

5.4 Conclusion

This paper develops and applies a new approach for measuring the impact of government cash transfers on poverty alleviation that takes into account endogenous reactions and consumption smoothing of households. This approach is used to study changes in government cash transfer policies in Russia during 1994 and 1998. The main findings are as follows.

Standard incidence studies, which ignore consumption smoothing, are likely to be misleading. Government transfers need to be assessed not only with regard to their targeting efficiency but also with respect to their impact on household consumption. The regression results show that the propensities to consume vary by income source and are typically less than unity. The coefficients increase when they are instrumented for income sources, implying that the propensities to consume are higher for permanent than for transitory income components. This distinction is especially important in the context of Russia, where households were exposed to large income shocks.

The cross-sectional regressions for pensions suggest that the marginal propensity to consume increases once other income is controlled

[23] Assuming a propensity to consume of unity, at least 27 percent of the rise in poverty is due to cash transfer changes, and at least two thirds of it is due to the transfer growth effect. Ignoring consumption smoothing leads hence to an overestimate of the impact of changes in government transfers on poverty.

for. This pattern is consistent with the view that pensioner households substitute shortfalls in pensions with other sources of income. However, the result does not hold for fixed effects regressions, while the coefficients on child benefits are not measured precisely. The analysis of the channels of endogenous responses in the following chapters will confirm the importance of accounting for behavioural reactions.

Across income sources, the estimates for pensions are higher than those for child benefits and other incomes. This result is confirmed for food expenditures only and households that receive both pensions and child benefits. Pensions are a regular form of income, and were less subject to arrears than wages and child benefits. The coefficient on pensions is consistently less than unity. Once instrumented, the estimate on pensions in the fixed effects estimations is no longer statistically different from unity. This result is consistent with an interpretation that the regular part of pension payments is close to a notion of permanent income.

The impact of changes in government cash transfer policies on poverty is quantified with a decomposition technique. A part of the change in household expenditures is attributed to the changes in cash transfers using the estimates for the propensities to consume. The quantitative effects vary by poverty statistic and reference period, but at least one seventh of the rise in poverty between 1994 and 1998 was due to the changes in cash transfer policy. Both changes in average transfer levels and the distribution of transfers increased poverty, and the transfer growth accounted for at least three fifth of the rise.

The changes in transfer entitlements and payment arrears during 1994 and 1998 were a reflection of the economic and political dynamics. Pension entitlements fell in 1995 as part of a renewed effort to achieve fiscal consolidation. Political pressures in the run-up of the Presidential elections in Summer 1996 led to increases in cash transfer entitlements. They were non-affordable due to the ongoing decline in tax revenues, and the lack of funds resulted in a rise of arrears. The substantial fiscal imbalances across regions led to a strong regional variation in the incidence of arrears both for pensions and child benefits. The rise in inflation after the financial crisis of

August 1998, and the failure to index cash transfers for inflation, reduced benefit levels again. This contraction in real entitlement levels allowed the reduction in the incidence of payment arrears without higher budgetary spending.

Chapter 6

The Elderly and Pension Arrears

6.1 Introduction

Throughout the world, households face income risks and volatility, for example due to job loss and unemployment, or unanticipated health shocks.[1] There has been a great deal of research on the ability to smooth consumption in the face of income fluctuations, and the mechanisms through which this is accomplished (Besley 1995 and Morduch 1999). An equally important concern is whether there are health consequences associated with imperfect consumption smoothing and incomplete insurance (Strauss and Thomas 1995). Understanding the health consequences is important not only because health is an indicator of well-being in its own right, but also because of the potential for 'vicious cycles', wherein economic shocks lead to worse health, which in turn result in diminished earnings capacity or another income shock, such as job loss.

Ironically, in many parts of the world, public social insurance programs themselves are increasingly becoming sources of volatility at the household level. For example, many countries face concerns over the stability of their pension systems, especially due to population aging, system financing or management. Further, there have

[1]This chapter is based on a joint paper with Robert T. Jensen.

recently been several cases of pension crises (for example, Argentina, China, Poland and Russia), resulting either in extended periods of non-payment of benefits, or the erosion of entitlements to below subsistence levels. This instability can be expected to directly affect the well-being of the elderly, who are typically highly dependent on pensions as their largest, or only, source of income. This chapter focuses on the welfare and health consequences of the failure of the Russian pension system in 1996, and what strategies households employed to cope with the loss of income.

Prior to 1996, Russia's generous state pension system was fairly stable. Pension fund revenues, collected primarily through payroll taxes, were broadly sufficient to cover outlays. However, poor economic performance, weakened tax enforcement and a wave of tax amnesties and exemptions leading up to the Presidential elections in 1996 resulted in a sharp decline in payroll tax collection, compromising the financial stability of the fund. As a result, approximately 14 million of the 39 million pensioners underwent a sudden, prolonged period during which they did not receive any payments ('in arrears').

The chapter investigates two major themes. The first is whether the loss of the pension adversely affected health. Given the dependency of the elderly on the pension system, one might expect that a pension failure would lead to worse health, especially because of the diminished ability to purchase the inputs into health (for example, nutrition, medication and the use of medical services). In this spirit, this work adds to the growing literature concerned with the impacts of socioeconomic status on health (Fuchs 1993, Marmot 1994, McIntyre 1997, and Smith and Kington 1997). An advantage over previous studies is that I exploit an exogenous income shock, so the direction of causality is clear, and directly examine the use of specific health inputs which could lead to changes in health outcomes. Other studies have found positive benefits of exogenous increases in income; for example, in a 'reverse experiment' of the present case, Case (2001) and Duflo (2000) find that increases in pensions in South Africa lead to improvements in health. For Russia specifically, this study also provides an important link for understanding the dramatic decline in health that followed economic transition and the subsequent economic decline. Russia experienced in the 1990's one

of the largest peacetime (non-epidemic) declines in health in human history (Bobak et al. 1999 and Brainerd and Varavikova 2001). While the health and economic crises have separately received considerable attention from researchers, the links between the two are less well explored.

The second major theme of the chapter is the ability of households to respond to the loss of pension income. When an economic shock causes a decline in income, there are a variety of strategies that households can employ to maintain consumption, including changes in labour supply, adjustments to the stock of savings, credit and borrowing, or relying on private cash transfers from family and friends.

The sudden collapse of the pension system in 1996 implied that about 30 percent of the pensioners had to make ends meet without pension receipts. A 'before-after' comparison of economic and health outcomes of these pensioners in 1995 and 1996 would attribute any changes arising from other factors also to pension arrears. By contrast, comparing the 'before-after' differences for the group of pensioners falling into arrears in 1996 to those of a similar group of pensioners remaining without arrears in 1996 purges the impact estimates from changes due to other factors, as long a they affected both groups equally. The essence of the empirical strategy is to compare the outcome variables of interest (health and nutrition, labour supply, etc.) for households who were not paid their pensions with suitable 'control' or comparison groups of pensioner households that were. The identifying assumption is that in the absence of the pension crisis, the arrears and non-arrears groups would not have experienced different changes in factors that would have affected economic and health outcomes. While it is not possible to verify this assumption, the 1994 RLMS rounds presents an opportunity to conduct a 'pre-test' to investigate whether treatment and control group evolved similarly from 1994 to 1995.

The strategy relies on two sources of variation in the incidence of pension arrears to identify the effects: the variation of pension arrears across regions (donor versus debtor regions) and within regions (pension priority criteria). The first is created by the regionally decentralized structure of the pension system. Each of Russia's 89 administrative states or oblasts are independently responsible for

collecting taxes and making payments to pensioners. Since no given state has an exact match between receipts and entitlements, the system relies on the redistribution of surplus revenues from states with a high tax base relative to pension entitlements to those with a low tax base relative to pension entitlements. When payroll tax collection declined for both 'debtor' and 'donor' regions, the fiscally weak regions had lower revenues of their own and received reduced surpluses from the donors. Accordingly, while nearly all pensioners in wealthier regions continued to be paid, between one third and one half of pensioners in debtor regions experienced arrears. I also exploit variation within debtor regions created by program rules which establish priorities for which pensioners should be paid in the event of revenue shortfall.

These two sources of variation lead to two control groups. Comparing arrears pensioners with non-arrears pensioners in debtor regions only ensures that the impact estimates are not biased due to factors that changed for debtor regions relative to donor regions, such as economic conditions or the health system. Comparing arrears pensioners in debtor regions with non-arrears pensioners in donor regions who share the same characteristics reveals whether these characteristics lead as such to a change in outcomes, irrespective of pension arrears.

The analysis shows that the pension crisis had a large impact on living standards, with income declining by one third for arrears households, and poverty rates tripling to over 50 percent. There was also a significant decline in the purchase of inputs into health; daily intake of both calories and protein declined on average by 10 percent per person, and the use of medication and visits to doctors declined as well. Finally, men in arrears households were 5 percent more likely to die in the two years following the crisis, an increase in mortality risk comparable to being a smoker. These dramatic consequences arise despite the fact that households were able to respond in ways that mitigated the impacts of the shock. Households were able to replace on average approximately 20 percent of the lost pension income through increased working hours, asset sales, and borrowing. They also reduced substantially private transfers to other individuals.

The remainder of the chapter proceeds as follows. Section 6.2

discusses the pension crisis of 1996 in detail, since they form an important part of the identification strategy for the empirical analysis. Section 6.3 examines the impact of pension arrears on living standards and poverty. Section 6.4 discusses the empirical strategy, identification issues and presents the results of the effects of the pension on health inputs and outcomes. Section 6.5 tests for evidence of coping mechanisms and Section 6.6 concludes.

6.2 The 1996 Pension Crisis

The pension system has already been described in Section 5.2.2, so I will emphasis only a few characteristics which are important to the origins of the 1996 crisis. In 1995, the Pension Fund had 38 million beneficiaries (26 percent of the population), with total outlays amounting to 5.7 percent of GDP. Eligibility is not affected by current employment status. As a result, nearly 98 percent of individuals age-qualified for the pension reported receiving a pension prior to the crisis. The average pension was R1,700 (PPP$712) in 1996, which was just below the mean per capita household income among all Russians. The system is largely decentralized but there is a uniform 'vertical' structure throughout the regions. The funds obtained by the centre from approximately 15 'donor' regions, which have a large payroll tax base relative to pension entitlements, are redistributed in order to finance pension payments in 74 'debtor' regions. Column 1 of Table 6.1 shows estimates of regional 'self sufficiency', i.e., the ratio of payroll tax receipts to total benefit entitlements, with donor regions characterized by ratios above 100.[2] The data of the Russian Pension Fund confirm that many districts collect revenues far short of needs, while a few regions like Moscow City have surpluses.

Before 1996, Pension Fund revenues were just sufficient to meet entitlements, with no excess funds to ensure future payments. In 1996, a significant funding crisis developed. The crisis was caused in part by a sudden decline in economic output due to an uncertain political climate created by the impending presidential elections.[3]

[2]It includes only regions covered by the RLMS.

[3]Enterprises and investors postponed decisions while awaiting the outcome of

Thus, there was a large reduction of the tax base, especially for the payroll taxes financing the pension system. Payroll tax revenues also fell because of a series of tax exemptions and amnesties throughout major sectors of the economy, granted in the run-up of the elections. Tax collection shortfalls were exacerbated by the emergence of non-monetary forms of settling tax obligations (for example, barter or payment in goods) that could not be transferred across regions.

The decline in payroll tax revenues and use of non-monetary forms of tax settlement led to a breakdown in the redistributive system from donor to debtor regions. Table 6.1 shows that between 1995 and 1996, pension offices in most regions experienced a decline in their tax revenues relative to entitlements. Donor regions used their receipts to fund their own pension payments, and the residual sums transferred for redistribution to other regions were insufficient to prevent sharp increases in pension arrears in debtor regions. While there are no official data on arrears, press releases of the Russian pension fund in the Moscow Times report national arrears of R14 trillion by December 1996. The RLMS provides estimates of arrears at aggregated geographic levels. Table 6.2 presents the percentage of pensioners who report not receiving a pension. Overall arrears increased from approximately 9 percent at the end of 1995 to 34 percent in 1996. Variation across the eight geographical groupings is considerable. Not surprisingly, regions such as the Metropolitan area, which includes primarily the donor districts of Moscow and St. Petersburg, had only minimal pension arrears, with very little change between the two periods. However, all other areas had large increases, and between 28 and 55 percent of pensioners in arrears in 1996.

When it became clear that revenues would fall short of the amount needed to make payments to all pensioners, the central pension fund adopted guidelines suggesting priority be given to first paying pensioners with entitlements less than the minimum subsistence level, followed by non-working and single pensioners, since these groups

elections in July. The uncertainty was caused in part by the poor performance of pro-govemment parties in parliamentary elections in late 1995. Polls showed president Yeltsin trailing his Communist opponent in the elections, including single-digit approval ratings.

Table 6.1: Pension district revenues as a percentage of district pension entitlements

Oblast	1995 (1)	1996 (2)
Almisky Krai	49.4	44.3
Amursky oblast	117.9	87.1
Chelyabinsk oblast	81.3	77.2
Chuvashskaya Republic	61.4	51.2
Kabudino-Balkar Republic	42.3	35.9
Kaluzhsk oblast	66.2	63
Komi Republic	144.1	106.5
Krasnodar Krai	66.5	64.2
Krasnoyar Kral	132.3	86.7
Kurgan oblast	56.6	49.5
Leningrad oblast	61.8	85.9
Lipetsk oblast	66.2	72.8
Moscow	153.7	178.7
Moscow oblast	77.8	80.9
Nizhegorod oblast	73.1	87.6
Orenburg oblast	74	63.5
Penzenskaya oblast	47.1	45.2
Penn oblast	93.3	87.9
Primorski Kral	134.5	110.6
Rostov oblast	61.7	52.4
Saratov oblast	57.4	51.5
Smolensk oblast	54.9	54.1
St. Petersburg City	92.4	100.1
Stayropolsky Krai	59	55.9
Tambov oblast	43.4	37.1
Tatarstan Republic	93.7	75.7
Tomsk oblast	110.9	98.8
Tulsk oblast	50.9	47.8
Chanty-mansi AO	506.5	624.2
Yamalo-Nenetsky AO	820.6	940.6
Tversk oblast	55.7	51.7
Udmurtia Republic	71.3	67.4
Volgograd oblast	75.1	71.6

Source: Pension Fund of Russia.

Notes: Net donors in 1995 are shown in bold italics.

Table 6.2: Incidence of pension arrears by region (share of pensioners reporting not receiving a pension)

	1995 (1)	1996 (2)
National	9	34
Geographic Regions		
Metropolitan	6	4
Northern and North Western	6	28
Central and Central Black-Earth	9	29
Volga-Vaytski and Volga Basin	8	38
North Caucasian	13	55
Ural	9	31
Western Siberian	20	45
Eastern Siberian and Far Eastern	1	30

Notes: The sample includes individuals eligible for pensions. The numbers show the percentage of pensioners not receiving pensions during the last 30 days.

were perceived to be the 'most vulnerable'. However, as the system is decentralized, in addition to these two criteria some regions also chose to prioritise very old or disabled pensioners.[4] Regional authorities typically applied pre-crisis attributes in determining priority; thus it is unlikely that individuals engaged in behaviour intended to increase their likelihood of payment (i.e., changes in labour supply or marital status).

The incidence of pension arrears across and within regions is further explored in Table 6.3. It estimates probit regressions for the probability of pension receipt (among pensioners) in 1996 (marginal effects reported). Column 1 regresses pension receipt on the self-sufficiency ratio in the oblast of residence. The effect is positive and statistically significant, confirming that the arrears crisis was concentrated in areas with low pension fund revenues and dependence on redistribution. Column 2 adds indicators for the various priority characteristics for payment during the crisis. In accord with the rules suggested by the pension fund, pensioners with the lowest pensions were 5 percent more likely to be paid, and single pensioners were 10 percent more likely to be paid. The set of priority criteria are jointly statistically significant, with an F-statistic of 12.8. Column 3 adds a set of individual and household characteristics aside from the official priority criteria. There is little evidence that they affect the probability of pension receipt, once the priority characteristics are controlled for. In particular, pre-crisis non-pension income is not statistically significant, consistent with a lack of means testing in determining arrears.

Column 4 to Column 6 restrict the sample to only those pensioners living in debtor regions. Even conditional on residing in a debtor region, the coefficient on the sufficiency ratio shows that being in a region that is less dependent on redistribution makes it more likely that an individual was paid. The priority variables are jointly significant, as lower pension benefits and being single made it more likely that an individual was paid. Again, household characteristics other than the priority characteristics are neither individually nor jointly significant. Overall, the regressions confirm that the collapse

[4]Only Orenburg oblast reduced payment to all pensioners rather than paying some in full and others nothing.

Table 6.3: Determinants of pension receipt in 1996

		Full pensioner group			Debtor regions only		
		Coeff. (1)	Coeff. (2)	Coeff. (3)	Coeff. (4)	Coeff. (5)	Coeff. (6)
Local/regional characteristics							
Sufficiency ratio	*Coef*	0.002	0.003	0.002	0.008	0.008	0.008
	z-st	5.3	10.7	5.3	9.2	9.9	9.4
Payment priority							
Low pre-crisis pension?	*Coef*		0.054	0.067		0.095	0.130
	z-st		1.2	1.9		1.7	2.2
Single?	*Coef*		0.097	0.093		0.099	0.076
	z-st		2.8	2.0		2.4	1.7
Elderly?	*Coef*		0.053	0.062		0.24	0.200
	z-st		0.7	0.1		1.9	1.6
Working?	*Coef*		-0.033	-0.022		-0.067	-0.068
	z-st		-0.9	-0.6		-1.5	-1.5
Disabled?	*Coef*		0.127	0.115		0.023	0.011
	z-st		1.4	1.2		0.1	0.1
Individual and household characteristics							
Income without pension	*Coef*			2E-06			4E-07
	z-st			1.1			1.4
Household size (#)	*Coef*			-0.012			-0.007
	z-st			-1.1			-0.5
Members aged 0-15 (#)	*Coef*			0.012			-0.015
	z-st			0.5			-0.5
Male?	*Coef*			0.025			0.044
	z-st			1.2			1.4
Education (years)	*Coef*			0.003			0.003
	z-st			1.3			1.0
F-test priority rules			12.8	8.5		15.7	13.5
Log likelihood		-1146	-1170	-1139	-955	-1002	-938
Observations (#)		2066	2066	2066	1627	1627	1627

Note: The dependent variable is an indicator variable of whether the household is receiving pensions. The sample is restricted to elderly eligible for old-age pensions. The coefficients are marginal effects of probit regressions.

of the redistributive system accounts for the incidence of pension arrears, and within debtor regions, specific indicators determined which pensioners were paid. Furthermore, household and individual characteristics aside from the specified priority characteristics did not affect the probability of pension receipt.

6.3 Economic Impact

The dramatic impact of the pension crisis on living standards can be seen in the bottom panel of Table 6.4. I separate the pensioner household sample into three groups: households that were in arrears; all pensioner households not in arrears; and the subset of non-arrears pensioner households living in debtor regions. The latter split is designed to reduce some of the heterogeneity among non-arrears pensioners, by distinguishing those who live in wealthier regions. Poverty was high even before the crisis, with over 20 percent of all three groups living below the official poverty line.[5] The share of total expenditures devoted to food is nearly two thirds. This budget share is itself often used as an indicator of living standards, and in the present case also demonstrates that food consumption is likely to suffer when households lose a large source of income like the pension.

Households are very dependent on the pension; before the crisis, the average income share of the pension was over 40 percent for all groups. Thus, not surprisingly, the crisis had a large impact on household welfare. Household income declined on average by R1,815 (24 percent) for the arrears group, whereas the income of the other pensioner groups increased slightly. The poverty rate increased to over 50 percent among arrears households, and dropped among non-arrears households. Figure 6.1 provides non-parametric (kernel) density estimates for (log) income per capita for the arrears and non-arrears (debtor and donor regions combined) pensioner households.[6]

[5]Further analyses of poverty in Russia include Mroz and Popkin (1995), Klugman and Braithwaite (1995) and Lokshin and Popkin (1999).

[6]The four graphs of Figure 6.1 display kernel density estimates of log income per capita. The graph in the top left-hand side corner shows log income per capita in 1995 and 1996 for households with pension arrears. The graph on the top right shows log income per capita in 1995 and 1996 for households without

Table 6.4: Summary statistics of members of pensioner households by pension arrears status

		Arrears		Non-arrears		Non-arrears debtor regions	
		1995 (1)	1996 (2)	1995 (3)	1996 (4)	1995 (5)	1996 (6)
Individual characteristics							
Male?	*Coef*	0.43	0.43	0.40	0.40	0.40	0.40
	SE	0.01	0.01	0.01	0.01	0.01	0.01
Education (years)	*Coef*	7.8	7.9	8.7	8.8	8.4	8.5
	SE	0.22	0 21	0.12	0.12	0.13	0.12
Currently employed?	*Coef*	0.38	0.39	0.38	0.37	0.32	0.33
	SE	0.01	0.02	0.01	0.01	0.01	0.01
Wage arrears (%)	*Coef*	0.08	0.1	0.06	0.08	0.06	0.09
	SE	0.01	0.01	0.01	0.01	0.01	0.01
Demographic characteristics							
Household size (#)	*Coef*	3.5	3.5	3.3	3.3	3.3	3.4
	SE	0.15	0.15	0.09	0.09	0.04	0.04
Household contains only pensioners?	*Coef*	0.29	0.3	0.26	0.28	0.35	0.33
	SE	0.01	0.01	0.01	0.01	0.01	0.01
Pensioners in household (#)	*Coef*	1.5	1.5	1.5	1.5	1.2	1.3
	SE	0.04	0.04	0.02	0.03	0.01	0.01
Members aged 0-15 (#)	*Coef*	0.63	0.63	0.59	0.58	0.65	0.61
	SE	0 07	0.08	0.04	0.04	0.03	0.03
Economic characteristics							
Income (R)	*Coef*	7620	5805	7231	7726	7130	7439
	SE	218	263	192	189	257	216
Pension income (R)	*Coef*	2434	0	2389	2460	2312	2620
	SE	60	0	50	58	262	71
Share of expenditure on food (%)	*Coef*	0.67	0.71	0.66	0.65	0.67	0.66
	SE	0.01	0.01	0	0	0	0.01
Poverty headcount (%)	*Coef*	0.17	0.54	0.20	0.17	0.22	0.18
	SE	0.01	0.03	0.02	0.02	0.02	0.01

Notes: The sample includes pensioner households receiving all pension entitlements during the last 30 days in 1995. Columns 1 and 2 refer to households not receiving all pension entitlements during the last 30 days in 1996. Columns 3 and 4 refer to households receiving all pension entitlements during the last 30 days in 1996. Columns 5 and 6 refer to the subsample of columns 3 and 4 covering debtor regions only. The numbers show means and standard errors of personal and household characteristics by arrears category.

The right-hand graphs present the differences between the estimated densities. The vertical line represents the (log) poverty line. Overall, pension arrears caused a large shift of mass in the density, especially from the middle of the pre-crisis distribution into the lower end. Arrears lead to a large reduction in households just above the poverty line and a large increase in the percentage below that line. There is also a large increase in the dispersion of incomes, since prior to the crisis pensions accounted for a large fraction of total household income, and there was not a great deal of variation in pension levels. The estimated density for the non-arrears group changed only slightly over this period, with more mass in the density significantly above the poverty line and less just above and below the line. Thus, the loss of the pension had a dramatic impact on living standards; however, below I show that households were able to respond in ways that somewhat reduced the loss.

6.4 Health Impact

Aside from living standards, one concern with the loss of income is possible health implications. Following a standard 'demand for health' framework (Grossman 1972), reduced income may lead to lower purchases of all goods, including health (or the inputs into health). Rather than explicitly modelling the production process, I first trace changes in the use of health inputs (daily intake of calories and protein, and use of medical services and medicines), and then examine the reduced-form effects of pension loss on health outcomes (functional limitations, chest pains, and mortality).

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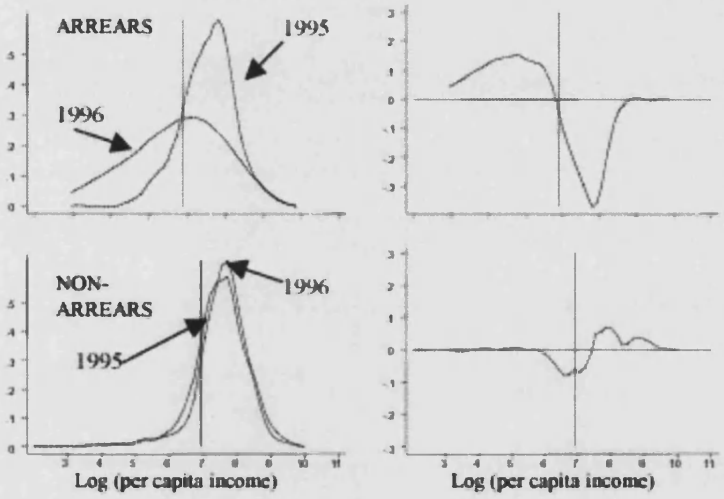
pension arrears. The graph on the top left shows log income per capita in 1995 and 1996 for households with pension arrears. The graph on the top left shows the difference between 1996 and 1995 log income per capita for households with pension arrears. The graph on the bottom left shows the difference between 1996 and 1995 log income per capita for households without pension arrears.

Figure 6.1: Per capita income densities



6.4.1 Estimation

As before, changes in the various health-related variables (inputs and outcomes) for the group of pensioners who went into arrears are compared to those who continued to be paid. This relies on the variation in pension arrears across regions (created by the decentralized funding structure) and within regions (created by the pension priority criteria). In order to isolate the impact of the loss of income on the health measures, the identifying assumption is that in the absence of the crisis, the arrears and non-arrears groups would not have experienced differential change with regard to the variables of interest, and that aside from the pension nothing else that could affect health changed differentially for these two groups. Momentarily deferring discussion of this assumption, Table 6.5 presents the essence of the basic strategy. It shows the average daily caloric intake for men living in arrears and non-arrears pension households. All individuals completed a personal, 24-hour individual recall of food intake, which was then converted into calorie and protein intake using standard food-calorie conversion charts. Using the panel element of the data, households are categorized by whether they were in arrears in 1996;

so for instance the data for the 'arrears group' in 1995 is average daily caloric intake in 1995 among men living in households that received a pension that year but were in arrears in 1996.

Panel A shows that prior to the crisis, individuals living in households that would later go into arrears consumed on average 80 calories more per day than individuals who continued to be paid in both periods. However, there is a striking change in 1996, where average daily caloric intake of the arrears group declines by 243 calories. The non-arrears households declined as well, but only by 22 calories. There could be a common factor that lead to some of the decline for both groups, such as the normal declining needs with age, relative price changes, or expectations.[7] Overall, the arrears group declined by 221 calories more per day than the non-arrears group, 10 percent of the original intake, which is the estimate of the impact of the loss of pension income, under the identifying assumption.

More detail on the changes in caloric intake can be seen by examining the distributions of caloric intake rather than just the means. Figure 6.2 shows kernel estimates of the density of (log) caloric intake for the arrears and non-arrears groups before and after the crisis.[8] The diagrams in the second column show the differences in the estimated densities, and the figure in the third column shows the differ-

[7]The control group could have reduced caloric intake in anticipation of being affected by the crisis. The survey asked respondents whether they expect their financial situation to get better or worse in the next 12 months (1 to 5 scale), and whether they anticipate having difficulties in having enough money to meet basic needs in the next 12 months. While many non-arrears pensioners felt things would get worse, equally as many felt the same way prior to the crisis. Thus, any adjustment in response to expectations would have been the same before and after the crisis.

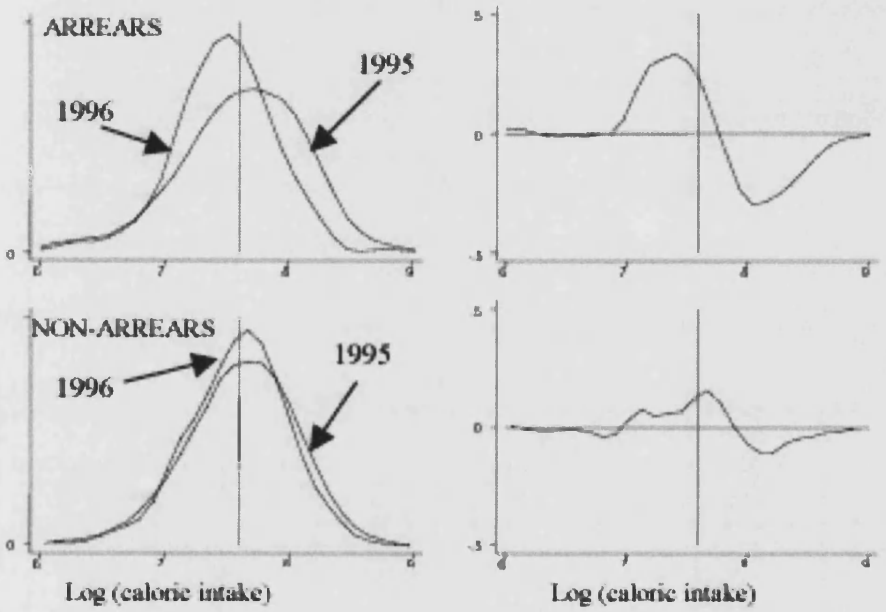
[8]The four graphs of Figure 6.2 display kernel density estimates of log caloric intake of male individuals. The graph in the top left-hand side corner shows log caloric intake in 1995 and 1996 for households with pension arrears. The graph on the top right shows log caloric intake in 1995 and 1996 for households without pension arrears. The graph on the top left shows log caloric intake in 1995 and 1996 for households with pension arrears. The graph on the top left shows the difference between 1996 and 1995 log caloric intake for households with pension arrears. The graph on the bottom left shows the difference between 1996 and 1995 log caloric intake for households without pension arrears.

Table 6.5: Daily caloric intake of male members of households with pensioners

		1995 (1)	1996 (2)	Difference (3)
A. Full Sample of pensioners				
Arrears pensioners	*Coef*	2213	1970	-243
(treatment)	*SE*	48	38	
Non-arrears pensioners	*Coef*	2133	2111	-22
(control)	*SE*	33	33	
Difference	*Coef*	80	-141	**-221**
	SE			51
B. Debtor regions only				
Arrears pensioners	*Coef*	2213	1970	-243
(treatment)	*SE*	52	31	
Non-arrears pensioners	*Coef*	2147	2130	-17
(control)	*SE*	43	37	
Difference	*Coef*	66	-160	**-226**
	SE			44
C. High vs. low probability arrears groups in donor regions				
Arrears pensioners	*Coef*	2179	2186	7
(treatment)	*SE*	52	47	
Non-arrears pensioners	*Coef*	1969	1953	-16
(control)	*SE*	31	42	
Difference	*Coef*	210	-233	**23**
	SE			48

Panel A includes as sample the male members of pensioner households receiving all pension entitlements during the last 30 days in 1995. Panel B includes the subsample of Panel A covering debtor regions only. In Panel A and B, the arrears or treatment group refers to households not receiving all pension entitlements during the last 30 days in 1996; and the non-arrears or control group refers to households receiving all eligible pensions during the last 30 days in 1996. Panel C includes the subsample of Panel A covering donor regions only. The arrears group refers to households with similar characteristics as arrears households in debtor regions; and the non-arrears group to households with similar characteristics as non-arrears households in debtor regions. The numbers show means and standard errors of caloric intake.

Figure 6.2: Caloric intake densities



ence in the differences. These figures demonstrate that there was an extremely large change in the distribution of caloric intake for the arrears group, with a large shift in mass from the middle and upper part of the pre-crisis distribution to the lower part. The vertical line represents the recommended (log) 2,000 calories per day. While exact caloric requirements vary across individuals by gender, age and level of physical activity, one can see that for any threshold around 2,000 calories, there is a substantial increase in the fraction of individuals in the arrears group not meeting that requirement after the crisis, with a much smaller change for the non-arrears group. The differential change for the two groups is large and striking.

In order to control for differences in other covariates relevant to health Difference-In-Differences (DID) regressions of the form are estimated:[9]

[9]Alternatively, I could to regress changes in the outcome variables on changes in pension receipt, or add individual fixed-effects directly to Equation 6.1. Results for these alternate specifications are reported below, but are nearly iden-

$$h_{it} = \alpha_0 + \alpha_1 * 1996 + \alpha_2 * A + \alpha_3 * A * 1996 + \beta * X_{it} + u_{it} \tag{6.1}$$

where $t = 1995, 1996$, $i = 1, ..., N$, h_{it} is the health related variable of interest, A is an indicator for whether a pensioner was in arrears, 1996 indicates the observation is from after the crisis, and X is a vector of individual and household characteristics thought to affect the health measure. The effect of arrears is captured by the interaction term α_3, which identifies the treatment effect of Equation ??. There may be concerns that areas with high arrears, which were driven by reductions in payroll tax contributions, experienced other changes, for example a decline in public funding for health care. In order to focus on within region variation in pension receipt, I add *region* and *region* $*$ 1996 indicators to the regression. For health-related independent variables, I use intake of calories and protein, two of the most important nutrients; whether the person was currently taking medication (conditional on having a chronic condition prior to the crisis); whether the individual visited a doctor in the previous month for a check-up; an index of functional limitations; self-report of chest pains; and whether the individual died by the time of a follow-up survey two years after the crisis. I restrict the sample to pensioner households, and in order to isolate the impact of the pension crisis in 1996, I drop households that incurred pension arrears in 1995 (though there were few of them, and their exclusion does not affect the results appreciably). The sample includes all individuals living in households with a pensioner in order to capture the effects of arrears on the entire household.

6.4.2 Identification

The primary interest is in isolating the effects of the loss of pension income on nutritional status and health. By comparing the change in caloric intake for arrears pensioners relative to non-arrears pensioners, I control for economy-wide changes (declines in the health

tical; thus, for the purpose of highlighting the identifying assumption, the DID framework is used.

system, pollution and the quality of environment, price changes or other macroeconomic shocks) that affected all individuals, or all individuals living with pensioners. However, assignment of arrears is correlated with living in a debtor region and having certain attributes, such as a higher pre-crisis pension level, having a job, or being married. A key part of the identifying assumption is that the factors determining the assignment of arrears should not in themselves be correlated with changes in the outcomes of interest, so that in the absence of the crisis, the arrears and non-arrears groups would not have changed differentially.

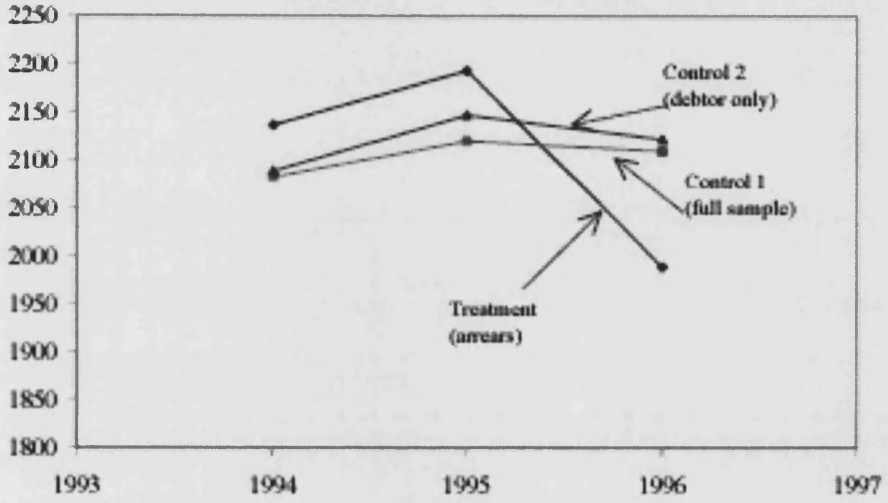
The first concern is whether other factors changed for debtor regions that would have an independent effect on the health variables, especially changes in economic conditions or the health system. This issue is treated in Panel B of Table 6.5, where I restrict the sample of non-arrears pensioners to only those living in debtor regions. Relative to the full control group, the initial level of caloric intake of this group is closer to the arrears pensioner group. However, the decline in caloric intake is nearly identical for both control groups, and the overall differential change between the arrears and control groups is very similar, supportive of the identifying assumption.

It is also possible to explore whether, within debtor regions, the characteristics associated with going into pension arrears are on their own correlated with declining caloric intake.[10] I use probit estimates of the determinants of pension arrears for individuals living in debtor regions (as in Table 6.3) to fit probabilities of arrears among pensioners living in donor regions. Thus, one way to view this exercise is that if there was concern that assignment of pension arrears was correlated with characteristics which would have lead to a greater decline in caloric intake even without the loss of the pension, then even donor regions should see the same relative decline in caloric intake among those pensioners with similar characteristics as the arrears group. Panel C of Table 6.5 shows that there was no such relative

[10]Of course, households that went into arrears were chosen because they were seen to be more robust and less vulnerable (higher pension, employed, unmarried) and thus one might expect that this group would have had a smaller decline in caloric intake had the crisis not occurred, and the estimates would be understated.

decline in donor regions for individuals with high and low probability of arrears, again supportive of the identifying assumption.[11]

Figure 6.3: Trends of caloric intake among pensioners



While it is not possible to observe the true counterfactual, one can merge the 1995-96 panel data with data from an earlier round of the survey (collected one year before the data used above). This provide a composite 'pre-test' of the identifying assumption that in the absence of the arrears crisis the paths of caloric intake would have been 'parallel' for the various groups. Figure 6.3 reveals that the paths of changes were very similar for the three groups in the pre-crisis rounds. Just as striking is the magnitude of the drop for the arrears group following the crisis, which stands out from previous changes, and makes it more convincing that the pension crisis caused the decline in caloric intake.[12]

[11]The fact that there was no relative decline for the high arrears probabil

Another aspect of the identifying assumption is that there may have been other factors within debtor regions that changed differentially for arrears and non-arrears households. The most natural candidate is whether additional social spending or assistance was also lost to arrears individuals, or whether arrears households were targeted for additional benefits or programs. While records from the social welfare offices do not show any evidence of such changes,[13] I can also approach the issue using the RLMS. Table 6.6 reports whether households received any transfers or benefits from the government (cash transfers, fuel or apartment benefits, or subsidized medication or visits to the doctor) or private charities. The likelihood of receiving the various benefits was fairly similar for arrears and non-arrears pensioner households in both periods. The only program with a large percentage of participants and moderate change over this period was the public payment of medical insurance premiums. However, the increase was the same for all pensioner groups. Overall, there is no evidence that there were any differential changes in other programs that could explain the results.

A final concern is whether individuals changed residence in response to the arrears problem, in particular relocating from high- to low-arrears regions in order to receive payments. However, official statistics reveal that mobility is extremely low (Chudinovskikh 1998), especially due to a number of substantial administrative, legal, economic and practical impediments.[14] To the extent that movement occurred at all, official or unofficial, it would not have enabled pensioners to increase their likelihood of receiving a pension, since

[13]There were some small-scale programs targeted towards all pensioners, regardless of arrears status, in some regions. However, most were implemented after the time of our survey, and provided only modest benefits, for example free transportation on city buses and trains.

[14]There are several reasons for lack of mobility. First, many pensioners live in housing belonging to their past or current employer, or in housing they own as, result of privatization; in either case, free or low-cost housing is often tied to the region of past employment. Furthermore, there is a shortage of housing in major metropolitan (low-arrears) areas. Second, many regions restrict migration through an official registration system. Third, individuals may receive in-kind benefits from past employers, which may be lost with a change of residence. Finally, the crisis was too sudden to have led to widespread migration, at least at the time of the survey.

Table 6.6: Pension arrears and public and private assistance

		Arrears		Non-arrears pensioners		Non-arrears debtor regions	
		1995 Mean (1)	1996 Mean (2)	1995 Mean (3)	1996 Mean (4)	1995 Mean (5)	1996 Mean (6)
Get fuel benefits?	*Coef*	0.018	0.024	0.008	0.01	0.01	0.007
	SE	0.004	0.004	0.002	0.002	0.002	0.002
Get apartment benefits?	*Coef*	0.043	0.048	0.083	0.116	0.082	0.104
	SE	0.006	0.006	0.006	0.007	0.007	0.008
Get stipend?	*Coef*	0.052	0.023	0.044	0.038	0.046	0.039
	SE	0.007	0.005	0.004	0.004	0.005	0.005
Medical insurance paid by government?	*Coef*	0.25	0.32	0.36	0.442	0.36	0.43
	SE	0.014	0.015	0.011	0.011	0.013	0.013
Eligible for medicine discount?	*Coef*	0.061	0.056	0.092	0.105	0.082	0.089
	SE	0.007	0.007	0.006	0.006	0.007	0.007
Assistance from private organization?	*Coef*	0.023	0.027	0.027	0.028	0.026	0.023
	SE	0.005	0.005	0.003	0.003	0.004	0.004

Notes: The sample includes pensioner households receiving all pension entitlements during the last 30 days in 1995. Columns 1 and 2 refer to households not receiving all pension entitlements during the last 30 days in 1996. Columns 3 and 4 refer to households receiving all pension entitlements during the last 30 days in 1996. Columns 5 and 6 refer to the subsample of columns 3 and 4 covering debtor regions only. The numbers show means and standard errors of the receipt of public and private assistance by arrears category.

payment is tied to original region of residence. Thus, selective migration is not an important concern for the empirical analysis, nor an important strategy for coping with the crisis.

6.4.3 Regression Results

The summary statistics for the sample are presented in Table 6.4. The most notable differences across groups are consistent with the payment priority rules, namely that arrears households are larger on

household size may work to the advantage of the elderly if younger household members are able to earn more when the pension income declines (akin to the 'added worker' effect).

Table 6.7: Regressions of men's caloric intake

		Full pensioner group				Debtor regions only				
		OLS	OLS	OLS	FE	OLS	OLS	OLS	FE	IV FE
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Pension arrears*1996	*Coef*	-239	-226	-228		-222	-227	-224	-221	
	SE	74	77	76		80	84	83	59	
Pension arrears	*Coef*	145	144	146	-258	146	146	147		-215
	SE	64	64	64	53	71	72	72		80
1996	*Coef*	30.1	21.5	29.6		27.5	21.2	27.3		
	SE	46	45	46		56	56	56		
Household size (#)	*Coef*	32.7	24.4	24.1	27.2	56.5	39.1	38.1	26.9	28.1
	SE	27	26	26	35	30	29	29	37	37
Members aged 0-15 (#)	*Coef*	1.07	17.5	16		-49.4	-11.4	-12.8		
	SE	51	49	48		58	57	56		
Age	*Coef*	1.5	2.3	2.2		2.2	2.9	2.7		
	SE	1.2	1.2	1.2		1.4	1.4	1.4		
Education (years)	*Coef*	34.8	32.6	32.1		32.9	32.7	32.4		
	SE	4.6	4.7	4.6		6.0	5.9	5.8		
Employed?	*Coef*	198	184	236	49	192	161	215	-3.0	-5.9
	SE	49	53	56	88	57	58	63	98	104
Income without pension	*Coef*		0.07	0.06	0.01		0.07	0.06	0.02	0.02
	SE		0.19	0.19	0.28		0.23	0.22	0.32	0.38
Wage arrears?	*Coef*			-167	-46.2			-178	-101	-120
	SE			75.7	18.1			80.5	92.4	96.8
Urban	*Coef*	-31.8	-21.3	-27.3		-41.5	-28.1	-35.2		
	SE	59	56	54		63	60	60		
Constant	*Coef*	1485	1376	1390	37.2	1450	1352	1376	1221	1243
	SE	112	116	117	127	143	145	146	161	164
Observations (#)		1958	1958	1958	1958	1532	1532	1532	1532	1532

Note: The dependent variable is caloric intake. The sample is restricted to male member's of pensioner households. In Column 9, pension arrears are instrumented using the person's attributes relevant for the payment priority as listed in Table 6.3.

Table 6.7 shows the regression results for caloric intake of men; for all specifications, standard errors are corrected for clustering at the *region* $*$ *year* level. Column 1 mirrors the strategy in Panel A of Table 6.5 and Equation 6.1, using the total sample of pensioners, and includes as explanatory variables the individual's age, education and employment status, as well as household demographic characteristics. Pension arrears were associated on average with a reduced caloric intake of 239 calories for the arrears group relative to the

control group, again representing approximately 10 percent of the pre-crisis intake. The estimate is very close to the tabular results in the previous section, suggesting that the assignment of pension arrears was uncorrelated with other characteristics of the household which might affect caloric intake. The decline in caloric intake is large from a nutritional perspective. The change in body weight depends on the amount of energy consumed (calories) versus the amount of energy expended (activity). Assuming that male pensioners expend the same amount of energy as before the crisis, the lowering of caloric intake translates into weight loss. If the reduction of daily caloric intake of 239 calories continues over an entire month, it would result in weight loss of around two pounds per month.

Column 2 adds non-pension income as determinant, excluded from the original regression because of concerns over endogeneity. As would be expected, higher non-pension income is correlated with higher caloric intake. However, inclusion of this income has little effect on the coefficient on pension arrears.[15]

Column 3 adds an indicator for whether anyone in the household was in arrears on wage payments from their employers. Since economic transition in 1992, Russian firms have frequently experienced difficulties in paying wages, leaving workers in arrears on wage payments. There may be concern that wage arrears are more likely to occur in areas with high pension arrears (since firms that had difficulties paying wages are likely to also have had difficulty paying payroll taxes). Therefore I include an indicator for whether any workers in the household were not paid wages in the previous month (I also included a 'stock of arrears' variable, the total amount of wages owed, with similar results). As expected, wage arrears themselves are associated with a substantially reduced caloric intake, nearly three-quarters as large as for the pension. However, the effect of pension arrears is unchanged. Column 4 performs regressions where the change in caloric intake is regressed on whether the individual went into pension arrears between 1995 and 1996, and changes in all other individual and household characteristics. This specification

[15]In an additional specification, instrumenting for income using various demographic characteristics of the household head, and occupation and industry if employed, yields similar results.

has the advantage of eliminating unobservable, fixed differences. The results are nearly identical to the DID regressions.

Column 5 through Column 8 present similar regressions, where the sample is restricted to debtor regions. The estimated effects, and nearly all other coefficients, are largely unchanged using this restricted control group, consistent with the tabular results earlier and with the conclusion that region-specific shocks or changes did not cause the sharp change in caloric intake for the pension arrears group. This also suggests that changes in other un-observable regional attributes are unlikely to explain the results, since they would affect non-arrears pensioners (and non-pensioners aged 50 and above) as much as arrears pensioners.[16]

Finally, a remaining concern is that households who went into arrears also lost or received other benefits; for example, while Table 6.6 showed that there was little change in other benefits for arrears and non-arrears groups, there may be attributes of households that received pensions that also made them more or less likely to gain or lose other benefits, especially those provided by employers.[17] One way to treat this concern is to instrument for being an arrears pensioner, using the payment priority criteria. This approach relies on the assumption that in the absence of arrears, high and low priority households would have experienced similar changes in caloric intake (Panel C of Table 6.5 showed that at least for donor regions, where there were no arrears, this was the case). Column 9 of Table 6.7 presents results from the change-on-change specification for households in debtor regions only, where pension arrears is instrumented using the person's relevant attributes that affect priority of pension receipt. The results are similar to those in the other specifications.

Overall, the estimated effects for men's caloric intake are extremely robust across specifications and control groups. Therefore, for the remainder of the results, I apply only the specification in col-

[16]I also estimated regressions for non-pensioner households using a dummy variable for living in a debtor region. Across all specifications, the coefficients for debtor are small and not statistically significant, suggesting there was no differential change in unmeasured health-related factors for non-pension households in debtor versus donor regions.

[17]For example, more powerful firms may provide more benefits and ensure their pensioners are paid.

umn 3, which includes income and wage arrears (results for the other health measures were similarly robust). Table 6.8 presents the estimated effects of the pension (α_3) on the other health-input variables of interest. The impacts of the crisis are smaller for women than men, with pension arrears associated with a decline of 163 calories on average. However, average male caloric intake is around 2100, whereas for women it is around 1800, so as a percentage of original intake, the results are fairly similar.[18] For both men and women, daily intake of protein declines by about 4 to 5 grams per person. These declines represent a reduction of 5 to 10 percent of the original levels. The recommended daily allowance (RDA) of protein is about 1 gram per kilogram of weight, or about 65 to 70 grams for men and 50 for women.[19] Following the crisis, the rate of protein deficiency among arrears pensioners increased by 7 percentage points for men and 4 percentage points for women, while the rate among non-arrears pensioners was unchanged.

The next three rows of the table show that the use of medical services was also slightly reduced for the arrears households relative to the non-arrears households. For the use of medication, I focus on individuals with chronic health conditions (heart attack, stroke, diabetes) who were taking medication prior to the crisis. Men and women were 4 to 5 percent less likely to report taking medications after the crisis, though the effect is only statistically significant for men. Since these conditions are chronic, and the decline in income would not be expected to improve them, this result suggests that

[18]Other studies have found that income has differential labor supply or health effects by gender of the individual and/or the recipient (Duflo 2001 and Betrand et al. 2000). This may arise because households do not share resources equally, with allocations instead affected perhaps by bargaining power within the household. In this context, the effects of changes in any individual's income on their own health or that of other household members may differ by gender. To explore this issue, I add *gender* * *arrears* * *year* interactions to Equation 6.1, still estimating the regressions separately by the respondent's gender. I find that both men and women have slightly lower reductions in health inputs and outcomes for female pensions (since they are slightly lower), but there is no significant interaction between the gender of the individual and gender of the pensioner, in contrast to the other studies.

[19]The RDAs are established by the Food and Nutrition Board of the US National Academy of Science (www.nal.usda.gov/fnic).

Table 6.8: Pension arrears and health inputs and outcomes

Dependent variable		Men (1)	Women (2)
Caloric Intake(kcal/day)	*Coef*	-228	-163
	z-st	76.3	73.2
Protein Intake (g/day)	*Coef*	-4.3	-4.7
	z-st	1.8	1.8
Take medication in last 7 days?	*Coef*	-0.045	-0.041
(if chronic condition and taking before crisis)	*z-st*	0.025	0.034
Had check-up in past 3 months?	*Coef*	-0.05	-0.02
	z-st	0.027	0.015
Doctor public, if saw doctor?	*Coef*	0.09	0.06
	z-st	0.022	0.044
ADL	*Coef*	1.4	0.13
	z-st	0.78	0.42
Chest pain?	*Coef*	0.079	-0.002
	z-st	0.044	0.032
Observations (#)		1958	2054

Notes: The numbers are coefficients and standard errors of the treatment effect from the DID regression as described in the text. For 'Take medication', 'Had check=up', 'Doctor public', and 'Chest pain', the coefficients are marginal effects from probit regressions.

the loss of income causes some individuals to forgo medications they would otherwise use. Regarding preventative care, pension arrears decreased the likelihood of seeing a doctor for a check-up or physical within the past year by around 5 percent for men, with little change for women. Finally, among those individuals who visited a doctor in the previous month, arrears pensioners were more likely to go to a public facility, where the fees are lower, rather than a private doctor. The common perception is that the latter are dramatically preferred. The observed switch to the former is another form of adjustment in the face of lost pension income.

The decline in nutrition and use of health services and medication could lead to worse health and increased mortality rates, especially among the elderly. While the specific contributions of these various health inputs cannot be untangled, I investigate in reduced-form whether the crisis lead to changes in health. As indicators of health status, I examine whether the person has experienced chest pains (an indicator of potential heart problems, the leading cause of adult mortality) and construct an index of physical limitations which broadly represents health status. For the latter, respondents aged 55 and older were asked to report their ability to perform various activities of daily living (ADL's) (for example, walking 1 kilometre, or climbing a flight of stairs) on a 1 to 5 scale from 'Not at all difficult' to 'Cannot do it.'[20] The index sums the scores of 10 different activities and ranges from 10 to 50. The mean value of the index is 20.6 for men and 24.6 for women. I follow the same empirical strategy as before, but include as additional regressions the initial values (1995) for various health related factors (obesity, whether an individual smokes, the number of years the person has smoked, and alcohol consumption). The bottom rows of Table 6.8 present the results. For men, going into arrears is associated with an increase in physical limitations (statistically significant at the 10 percent level);

[20]Possible responses were: 1. Not at all difficult; 2. Slightly difficult; 3. Somewhat difficult; 4. Very difficult, but possible; 5. Cannot do it. Activities were: walk across a room; walk 200 meters; walk 1 kilometer; run 1 kilometer; sit for 2 hours; stand up after sitting; climb one flight of stairs; climb several flights of stairs; lift and carry a weight of about 5 kilograms; squat, crouch or kneel.

the increase of 1.4 on the ADL scale represents about a 7 percent worsening over the mean functional limitation before the crisis. The likelihood of reporting chest pains also increases for men by 7 percent (again statistically significant at the 10 percent level). By contrast, for women, both results are small and not statistically significant. This result is consistent with the finding that women do not reduce as much the use of medicines or health services when they lose their pension, and also supports other research which finds that health and mortality worsened more dramatically for men than women in Russia, despite exposure to similar health risks (Shkolnikov, Cornia, Leon, and Mesle 1998).

Finally, I explore whether the pension arrears had an impact on mortality, merging the 1995-96 panel with RLMS data collected 2 years after the arrears crisis. Table 6.9 presents results (marginal effects) from probit regressions in which the dependent variable is whether the individual died in those two years. In addition to the regressors above, I also include initial values of the ADL index and whether the person had previously experienced chest pains. Pension arrears increased the likelihood that the individual died within the next two years by nearly 6 percent for men, an effect comparable to being a smoker. The coefficient just fails to be significant at the 5 percent level. For women, the effect is smaller, and not statistically significant. The differential mortality results are again consistent with previous studies showing that male mortality increased more than female mortality during this time. The signs of most of the predictors of mortality are in accord with expectations, though few are statistically significant. The ADL index, smoking and years smoked (for men) are all correlated with an increased likelihood of mortality.[21]

[21]Since mortality may be correlated with attributes that determine pension arrears, I compare mortality rates in alternate regressions for pensioners in donor regions who would have high and low probability of being arrears if they lived in debtor regions. There are no significant difference in the likelihood of death.

Table 6.9: Determinants of mortality

		Men (1)	**Women** (2)
Pension arrears	*Coef*	0.058	0.01
	SE	0.030	0.01
Age (years)	*Coef*	0.004	0.001
	SE	0.002	0.004
Obese?	*Coef*	0.021	0.014
	SE	0.026	0.077
Has experienced chest pain?	*Coef*	0.018	0.001
	SE	0.020	0.006
ADL Index	*Coef*	0.013	0.0063
	SE	0.004	0.0028
Smoker?	*Coef*	0.065	0.001
	SE	0.029	0.021
Smoking (years)	*Coef*	0.0012	-0.008
	SE	0.0007	0.016
Drinks alcohol?	*Coef*	0.001	-0.001
	SE	0.021	0.006
Household income	*Coef*	0.022	-0.003
	SE	0.034	0.0021
Observations (#)		642	1240

Notes: Marginal effects from probit regressions, where the dependent variable is whether individual died between 1996 and 1998 surveys. Sample is restricted to individuals over 50 years of age, in households with at least one pensioner.

6.5 Coping Strategies

As stated earlier, there are several ways households may respond to counteract the adverse effects of an income shock, for example changes by adjusting labour supply, savings or assets, or through private transfers from family or friends. Beyond their importance for understanding how households cope with income shocks, the magnitude of such private behavioural responses is important for the design and reform of social programs. If public programs largely crowd out private support activities, the net value of public safety nets and programs is reduced (Jensen 1999).

Table 6.10 explores the various mechanisms households may use to cope. It presents both mean values for the variables of interest (columns 1 to 4), as well as coefficients from DID regressions similar to those above (Column 5), where I control for other household and individual characteristics. In almost all cases, the regression results mimic the changes in means, so I only discuss the latter.

6.5.1 Labour Supply

Following the standard labour supply model where an individual has preferences over consumption and leisure, one would predict that a decline in income should lead to a decrease in the demand for leisure, and thus an increase in labour supply. For example, Betrand et al. (2000) find that a large increase in pensions to elderly South Africans lead to a large decline in labour supply among prime-aged adult men living with the pensioners. Since the assignment of pension arrears was based on pre-crisis characteristics, and in the absence of a means test, there should be no negative work incentives created by the pension. Provided that household members share income in any way, the decline in pension income could affect the labour supply of non-pensioners living with pensioners as well as the pensioners themselves. Table 6.10 reveals that in both periods a slightly greater percent of households in arrears have an individual employed, where I include both formal and informal sector employment. However, there was little change in employment rates for either group, indicating that the households who went into arrears did not compensate

Table 6.10: Coping mechanisms

		Arrears		Non-arrears		Coef
		1995	1996	1995	1996	a_3
Dependent variable		(1)	(2)	(3)	(4)	(5)
Employment status						
Anyone working in household?	*Coef*	0.65	0.64	0.60	0.60	-0.006
	SE	0.01	0.02	0.01	0.01	0.02
Hours worked per week (>0)	*Coef*	65.4	71.8	68.3	68.6	5.9
(total, all household members)	*SE*	0.81	1.4	1.2	1.2	1.3
Monthly wage earnings	*Coef*	2710	2905	3135	3080	250
	SE	200	204	110	102	110
Sales and borrowing						
Sold jewelry or property?	*Coef*	0.085	0.160	0.088	0.090	0.430
	SE	0.01	0.01	0.01	0.01	0.13
Amount sold if sold (R)	*Coef*	717	1052	498	650	192
	SE	199	131	50	104	41
Borrowed money in past 30 days?	*Coef*	0.12	0.19	0.15	0.16	0.15
	SE	0.01	0.01	0.01	0.01	0.03
Amount borrowed if borrowed (R)	*Coef*	300	369	403	382	108
	SE	37.1	34.5	54.2	53.7	91
Private transfers						
Received transfers?	*Coef*	0.12	0.16	0.10	0.15	-0.1
	SE	0.02	0.02	0.02	0.02	0.08
Amount received if received (R)	*Coef*	399	422	288	303	18
	SE	244	129	95	71	12
Given transfers?	*Coef*	0.26	0.18	0.25	0.21	-0.21
	SE	0.03	0.03	0.02	0.02	0.06
Amount sent if given (R)	*Coef*	610	392	493	399	125
	SE	213	115	128	119	43

Notes: The numbers are coefficients and standard errors of the treatment effect from the DID regression as described in the text. Other regressors in the regression are: # household members, # children, # elderly, household income excluding pension, and region indicators. For probit regressions, marginal effects, evaluated at the sample mean, are reported.

by getting jobs. This may have been due to the inability to obtain employment, rather than the desire to work. Employment rates were in general declining during this period, and in this context re-entry into the labour market may not have been feasible.[22] However, consistent with expectations, conditional on having a job before the crisis, total household labour supply (in all activities, by all members) increased by almost 6 hours per week more for arrears households relative to non-arrears households. The result was a relative increase in monthly wages of R250 for pension arrears households, representing over 10 percent of the average lost pension income. The magnitude of the response is even more striking since this is the effect for all households; the average household with a worker actually increased wage earnings by R350 (16 percent of lost pension income), while the 35 percent of households without a worker had no adjustment.

These results suggest there may be an important difference in the effects of arrears for different household types. For example, compared to households with only elderly persons, households with more members or workers may not only be less dependent on the pension as a share of total household income, but may also be more able to increase labour supply in response to the income loss. Table 6.11 shows the estimated effects of the pension on health, where the sample is split by whether the household contains only elderly persons (pensioners and spouses) or is an 'extended' household (contains younger members, such as adult children of pensioners). I restrict the sample to persons aged 50 and older to avoid comparing a sample of elderly persons to a sample with some non-elderly persons. There are noticeable differences in the effects of arrears; caloric intake declines by 35-40 calories more for men and women living only with elderly persons. The differential effects on the use of medical services and medication and most of the other health measures are also smaller. The largest differential health effect is that men living with only other elderly persons had almost twice as large a decline in the ability to perform the various ADL's. These results suggest the

[22]The survey asked individuals whether they are looking for work. There was a slightly larger increase in the percentage looking for work for those who went into arrears. However, looking for work itself reflects perceptions that employment is available, as in the 'discouraged worker' effect.

extended family can play a protective role in the presence of income shocks.

Table 6.11: Pension arrears and health inputs and outcomes by household structure

		Extended households		Elderly only	
		Men	Women	Men	Women
Dependent variable		(1)	(2)	(3)	(4)
Caloric Intake(kcal/day)	*Coef*	-213	-151	-251	-185
	SE	97.9	81.2	86.9	75.2
Protein Intake (g/day)	*Coef*	-4.2	-4.6	-4.5	-4.8
	SE	2.13	2.2	2.0	1.9
Take medication in last 7 days?	*Coef*	-0.045	-0.041	-0.046	0.041
(if chronic condition and taking before crisis)	*SE*	0.032	0.039	0.029	0.034
Had check-up in past 3 months?	*Coef*	-0.045	-0.01	-0.046	-0.02
	SE	0.037	0.021	0.031	0.017
Doctor public, if saw doctor?	*Coef*	0.09	0.06	0.09	0.06
	SE	0.033	0.051	0.028	0.045
ADL	*Coef*	0.83	0.08	1.6	0.28
	SE	0.60	0.32	0.55	0.37
Chest pain?	*Coef*	0.078	-0.002	0.081	-0.002
	SE	0.048	0.041	0.046	0.035
Observations (#)		507	723	801	881

Notes: The numbers are coefficients and standard errors of the treatment effect from the DID regression as described in the text. For 'Take medication', 'Had check=up', 'Doctor public', and 'Chest pain', the coefficients are marginal effects from probit regressions.

6.5.2 Sales and Borrowing

When faced with an income shock, the permanent income and life-cycle theories of consumption both predict that households should spend out of savings, or if they have no savings, should borrow on credit markets. How much they obtain through either source will of course depend on whether the shock is viewed as transitory or permanent. For a transitory negative shock, households should dissave/borrow, enough to bring current consumption up to permanent income, which will be the old permanent income minus the income shock divided by the number of expected periods of life remaining. For a permanent shock, the household revises downward the estimate of permanent income to a greater extent, and thus dissaves/borrows

the difference between this new, lower threshold and current income. Thus, shocks perceived to be permanent should be met with a smaller reduction in savings than transitory shocks.

There are numerous difficulties in measuring a household's stock of wealth. Wealth can take many forms; in Russia, very few households keep money in banks because of years of high inflation and concern for bank failures. Furthermore, financial markets were still young at this time, and inaccessible to most households. Many Russians thus hold US dollars, durable goods, jewellery, and housing as wealth. The lack of savings instruments and investment opportunities may have exacerbated the impact of the crisis, as most wealth was fairly illiquid, and the elderly had few options for saving or financing their retirement.

Households in the survey were asked to report sales of durable goods, and assets such as jewellery, currency, bonds, stocks, and other financial assets. Table 6.10 reveals that the percentage of households engaging in sales of these assets increased dramatically for the arrears group, from 8.5 percent before the crisis to 16 percent after the crisis, with little change for the non-arrears group. In regressions, the result is statistically significant, indicating that households who went into arrears were significantly more likely to engage in asset sales. The total income generated from these sales increased by approximately R350 between 1995 and 1996, though the increase relative to the non-arrears group was R192. While expectations are difficult to measure, in the period following the crisis nearly 60 percent of pensioners in arrears report that they do not expect things to get better in the next 12 months, suggesting a belief that the shock was more permanent. Households responded to the perception of the permanence of the shock in ways that are broadly consistent with the life-cycle model; asset sales by those arrears pensioners who perceive the shock to be permanent (think things will either stay the same as at present or get worse in the next 12 months) are less frequent and in smaller amounts on average than those who expect things to improve. The latter group increased asset sales by R500, compared to R150 for the former.

Households also engaged in significant borrowing (mostly from family, friends and neighbours, rather than formal credit markets)

in response to arrears. The percentage of households in arrears who borrowed money in the previous month increased from 12 percent to 19 percent, while there was little change for the non-arrears group. The average sale value also increased, though the increase relative to the non-arrears group is not statistically significant.

6.5.3 Private Transfers

Private transfers from family and friends, aside from loans, are another common mechanism through which households may cope with income shocks. Altruistically-linked households, where non-coresident members have utility functions that contain the consumption of the other members, should share income (Becker 1974). Briefly, if an individual i is utility interdependent with another individual $-i$, as in $U(C_i, C_{-i}) = U_i[V_i(C_i), V_{-i}(C_{-i})]$, the first-order conditions for utility maximisation require that the (weighted) marginal utilities of consumption of the two parties be equal. This in turn will imply that a decline in income of one party should be met with increases in transfers received from the other, or reduced transfers sent to others. Several authors have explored the relationship between household income and the level of private transfers received.[23]

Table 6.10 shows that private transfers are extremely widespread in Russia, with 30 to 40 percent of households with pensioners either sending, receiving or both. More than twice as many households with pensioners sent remittances as received. Over this time period the incidence of receipt of private transfers increased among all pensioners, with no differential improvement for the arrears pensioners in terms of receipt or levels. However, pension arrears households reduced their private transfers to other households much more dramatically than non-arrears households. Almost one third less arrears households sent transfers after the crisis relative to before the crisis, (compared to a 15 percent reduction among non-arrears pensioners),

[23]Altonji et al. (1991), Altonji et al. (1992), Cox (1987), Cox and Jimenez (1990), and Jensen (1999). Using RLMS data firm before the crisis, Cox et al. (1997) find that private transfers are widespread. They simulate that an income loss of R1, such as from pension reduction, could result in an increase of R0.23 in private transfers.

the difference between this new, lower threshold and current income. Thus, shocks perceived to be permanent should be met with a smaller reduction in savings than transitory shocks.

There are numerous difficulties in measuring a household's stock of wealth. Wealth can take many forms; in Russia, very few households keep money in banks because of years of high inflation and concern for bank failures. Furthermore, financial markets were still young at this time, and inaccessible to most households. Many Russians thus hold US dollars, durable goods, jewellery, and housing as wealth. The lack of savings instruments and investment opportunities may have exacerbated the impact of the crisis, as most wealth was fairly illiquid, and the elderly had few options for saving or financing their retirement.

Households in the survey were asked to report sales of durable goods, and assets such as jewellery, currency, bonds, stocks, and other financial assets. Table 6.10 reveals that the percentage of households engaging in sales of these assets increased dramatically for the arrears group, from 8.5 percent before the crisis to 16 percent after the crisis, with little change for the non-arrears group. In regressions, the result is statistically significant, indicating that households who went into arrears were significantly more likely to engage in asset sales. The total income generated from these sales increased by approximately R350 between 1995 and 1996, though the increase relative to the non-arrears group was R192. While expectations are difficult to measure, in the period following the crisis nearly 60 percent of pensioners in arrears report that they do not expect things to get better in the next 12 months, suggesting a belief that the shock was more permanent. Households responded to the perception of the permanence of the shock in ways that are broadly consistent with the life-cycle model; asset sales by those arrears pensioners who perceive the shock to be permanent (think things will either stay the same as at present or get worse in the next 12 months) are less frequent and in smaller amounts on average than those who expect things to improve. The latter group increased asset sales by R500, compared to R150 for the former.

Households also engaged in significant borrowing (mostly from family, friends and neighbours, rather than formal credit markets)

in response to arrears. The percentage of households in arrears who borrowed money in the previous month increased from 12 percent to 19 percent, while there was little change for the non-arrears group. The average sale value also increased, though the increase relative to the non-arrears group is not statistically significant.

6.5.3 Private Transfers

Private transfers from family and friends, aside from loans, are another common mechanism through which households may cope with income shocks. Altruistically-linked households, where non-coresident members have utility functions that contain the consumption of the other members, should share income (Becker 1974). Briefly, if an individual i is utility interdependent with another individual $-i$, as in $U(C_i, C_{-i}) = U_i[V_i(C_i), V_{-i}(C_{-i})]$, the first-order conditions for utility maximisation require that the (weighted) marginal utilities of consumption of the two parties be equal. This in turn will imply that a decline in income of one party should be met with increases in transfers received from the other, or reduced transfers sent to others. Several authors have explored the relationship between household income and the level of private transfers received.[23]

Table 6.10 shows that private transfers are extremely widespread in Russia, with 30 to 40 percent of households with pensioners either sending, receiving or both. More than twice as many households with pensioners sent remittances as received. Over this time period the incidence of receipt of private transfers increased among all pensioners, with no differential improvement for the arrears pensioners in terms of receipt or levels. However, pension arrears households reduced their private transfers to other households much more dramatically than non-arrears households. Almost one third less arrears households sent transfers after the crisis relative to before the crisis, (compared to a 15 percent reduction among non-arrears pensioners),

[23]Altonji et al. (1991), Altonji et al. (1992), Cox (1987), Cox and Jimenez (1990), and Jensen (1999). Using RLMS data firm before the crisis, Cox´et al. (1997) find that private transfers are widespread. They simulate that an income loss of R1, such as from pension reduction, could result in an increase of R0.23 in private transfers.

and the amount sent conditional on sending was 125 less relative to the non-arrears group, accounting for 5 percent of the lost pension income for those households that sent remittances. This suggests not only that individuals share income even when not co-resident, but also that the effects of the pension crisis are felt outside of pension households, since pensioners support others.

6.6 Conclusion

This chapter argues that Russia's financially unstable pension system, characterized by irregular payments and adjustments in pension levels, took a large toll on the financial and physical well-being of the elderly and their dependents. While there were significant adverse consequences of pension loss, households responded to the income shock in rational ways that are consistent with economic theory. Between increased hours of work and sale of assets, households replaced on average almost 20 percent of the lost pension income. In the absence of such adjustments, the impacts on health most likely would have been worse. However, households where the pensioner is not able to work, or where there are no other co-resident members who can work, and where there are few assets, are likely to be hurt more by the loss of an income source.

Chapter 7

The Elderly and Wage Arrears

7.1 Introduction

A growing empirical literature investigates the connection between health outcomes and economic status. Studies on industrialized countries find evidence for a health gradient, linking high socioeconomic status to good health and low mortality, across gender and age groups (Kitagawa and Hauser 1973, Marmot and Wilkinson 1999 and Wilkinson 1996). However, the bulk of these studies is based on cross-sectional analysis and fails to identify exogenous sources of variation in household income.[1] In a standard household production model, income and health (or in a dynamic context, assets and health) are jointly determined (Strauss and Thomas 1995). This interdependency makes it difficult to pin down a causal relationship between economic and health status, and invalidates predictions about the effects of additional economic resources on health outcomes. For example, higher income enables individuals to purchase more of good health, yet good health enables people to earn more income.

Disentangling the two-way interaction between health and economic status is especially complicated for the elderly (Smith 1998

[1] A number of papers have looked at the impact of rainfall variation, a covariate shock, on consumption (Paxson 1992), child health (Hoddinott and Kinsey 2001) and murder rates (Miguel 2003).

and Smith and Kington 1997). Contemporaneous feedback from health to economic status may be considered unlikely at old age, as pension receipts are not related to current health status. However, health outcomes at old age are influenced by the entire history of current and past health inputs and behaviours. Health conditions in middle age could, by reducing earnings, lower retirement income. As health status during middle and old age is closely linked, any positive association of pensions and current health could just reflect better health at pre-retirement age. Smith (1998) argues that the correlation between health and current-period income of the elderly population in the US mostly reflects causation from health to socioeconomic status, as health shocks dominate economic shocks. This could also explain why the differences in mortality across socioeconomic groups tend to decline in old age relative to late middle age (Deaton and Paxson 1998).

However, elderly often live together and share resources with wage earners. Shocks to wage income are likely to affect not just the welfare of the working age, but also other household members, including the elderly. This chapter explores the impact of the wage arrears crisis on old age health in Russia during the mid-1990s, when about one third of household with elderly suffered from non-payment of wages.[2] Just like many countries of the former Soviet Union, Russia's economic transition was marked by a sharp and persistent rise in wage arrears. According to official data, they first became more common in 1994, rose sharply in 1996 and peaked in 1998, before declining rapidly after a large macroeconomic adjustment. While temporary wage arrears are common in developed market economies for small start-up companies or bankrupt firms, wage arrears in Russia were widespread in many sectors, regions and organizations, and persisted over a number of years (Earle and Sabirianova 1999). Wage arrears reduced not just the living standards of employees, but also of their dependents and cohabitants (Desai and Idson 1998).

The life expectancy of the Russian population is one of the lowest in Europe. In 1998, male life expectancy amounted to 61.4 years in

[2]Stillman and Thomas (2002) study the same period and country as this paper, looking at the impact of income flucations, instrumented with the oil price, on nutritional status.

1998, and female life expectancy to 73.3 years, which is 4 years lower for women and 7 years lower for men than the average in western and central Europe. At the age of 65, Russian men expect to live another 11.4 years and Russian women another 15.3, about 4 years shorter than their counterparts in western and central Europe (Centers for Disease Control and Prevention 2002). Low health status is not just a legacy of the Soviet period, but also reflects an unprecedented upswing in morbidity and mortality rates in the early 1990s. Infectious and parasitic diseases have increased, as have prevalence rates of hypertension, tied to a rise in cardiovascular diseases especially for the group of working age male (Shkolnikov et al. 1998).

This chapter applies matching techniques to assess the impact of wage arrears on the elderly in arrears households. This method deviates from Desai and Idson (1998) who apply cross-sectional regression with wage arrears as indicator variable on the right-hand side. As explained in Section 2.5, matching has important advantages over regression estimation. As a non-parametric technique, it does not rely on a specific functional form and accounts for heterogeneity in the treatment effect. It identifies the impact of wage arrears on the elderly with wage arrears. Each arrears elderly is matched only to those non-arrears elderly who are similar in terms of observable characteristics. Imposing the common support between treatment and control groups ensures that the impact estimates are obtained only for those sets of observables where such similar control units exist.

The key identifying assumption is that arrears assignment is not dependent on unobservables, so that once arrears and non-arrears elderly are matched along observables, any difference in outcome variables derives from the wage arrears treatment. By drawing on firm and regional characteristics, the matching procedure ensures that arrears and non-arrears households are placed in a common economic and geographic environment. Furthermore, arrears elderly are matched to non-arrears elderly only within the same gender-year-age group category. Balancing tests show that the treatment and control groups are well aligned along key characteristics. The robustness of the main findings to alternative weighting schemes is confirmed.

One common concern is that the selection into wage arrears may

depend on unobservable fixed effects, such as unobserved productivity or geographic characteristics. One way to address this problem is to combine matching estimation with difference-in-differences estimation. However, in contrast to pensions, the wage arrears crisis affected a significant proportion of the labour force from 1994 to 1998, and relatively few households change wage arrears status from one round to the next. For the sample analysed in this chapter, difference-in-differences matching is based on only 30 percent of the number of impact estimates compared to cross-sectional matching.

This analysis exploits the fact that most elderly either work themselves or live together with wage earners. Applying matching estimations to a nationally-representative data set, the study shows that old age health status declines significantly as a result of wage arrears. I employ two safeguards to prevent contamination of the estimates by feedback from health to economic status. The non-payment of wages is related to occupational, sectorial and regional characteristics rather than to the health status of employees. More importantly, the bulk of the elderly does not work themselves and depends on wages earned by other household members.[3] In addition, wage arrears could reflect a general economic decline in certain regions which could affect health through many different channels, including pension arrears, worsening in the access and quality of health services, deterioration in environmental conditions, and behavioural risk factors like smoking and drinking. I exploit a rich data set to conclude that these factors contribute little to the decline in old age health status.

The rest of the chapter is organized as follows. The next section introduces the data set, lays out the estimation strategy, explains the choice of the sample, and explores key identification issues. Section 7.3 turns to the impact of wage arrears on the elderly living in arrears households. It discusses the effects on economic well-being, including coping mechanisms, and health status, covering utilization of health

[3]Duflo (2000) investigates also the link between household resources received by one household member on health outcomes of other members. She studies the impact of the sudden expansion of the old age pension program to the non-white population in South Africa on the anthropometric status for children living with a pension recipient.

service, health behaviour, nutrition, cognitive functions, activities of daily living, chest pains, self-rated health, and survival between survey rounds. Section 7.4 scrutinizes the main findings with regard to subsamples, wage arrears definitions, and estimation techniques. The final section concludes.

7.2 Methodology

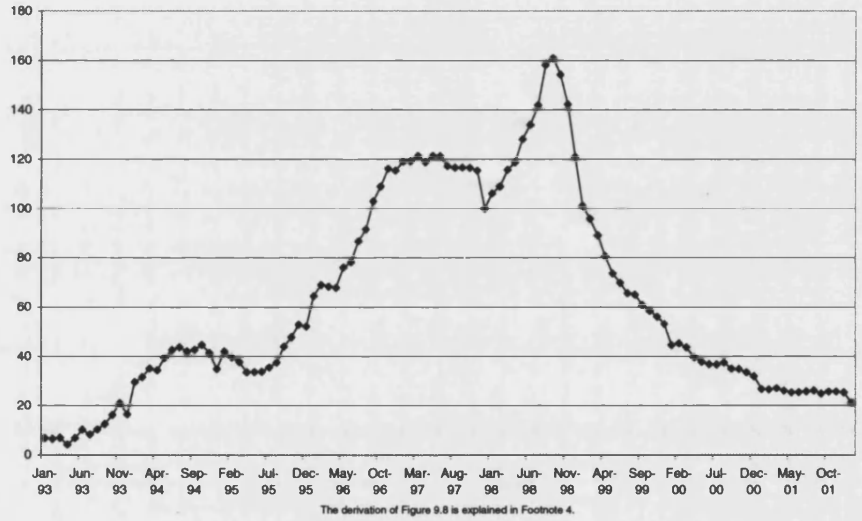
7.2.1 Wage Arrears

Wage arrears represent wage entitlements of workers that enterprises fail to pay in time. After the system of secure regulated life-time employment collapsed in the early 1990s, wage arrears first became a problem in 1993-94. According to Goskomstat data, they increased tenfold in real terms between spring 1993 and summer 1994. From September 1995 until October 1998, the stock of real wage arrears further increased, before it finally declined with the recovery in the economy after a large macroeconomic adjustment (Figure 7.1).[4] Measuring wage arrears requires clarifying the definition of jobs and wages. The RLMS distinguishes three types of occupation (primary, secondary, and informal). About two thirds of the working age population are in regular employment. Of those, only 3 percent have secondary jobs. In addition, slightly less than 10 percent work also in informal jobs. Since multiple job holdings are rare, and information on wage arrears from informal employment is missing, the analysis concentrates on primary jobs. Ideally, I would like to calculate the net present value of wage arrears based on the cash flow of wage payments and wage entitlements over a longer period. However, the RLMS provides information only on whether a worker is owed wages, and the amount of wage payments during the last 30 days. Depending on the periodicity of wage payments, some workers may not have received any salary during the last 30 days but not be owed any wages, while others may have accumulated wage claims in the past but received wages more recently. I define wage arrears

[4]Figure 7.1 shows the stock of real wage arrears from January 1993 to December 2001 according to the Goskomstat enterprise survey. December 1997 is set equal to 100.

as the joint incidence of outstanding wage claims and the absence of wage payments during the last 30 days. This concept combines the absence of recent wage receipts with outstanding entitlements to wages. I will return to this definition in Section 7.4.2.

Figure 7.1: Amount of outstanding real wage arrears (December 1997=100)



Using this concept of wage arrears, the non-payment crisis affected on average one fifth of the labour force. The share of employees with wage arrears rose from 15 percent in 1994, to 18 percent in 1995, and peaked at 26 percent in 1996 before declining to 21 percent in 1998.[5] The literature has advanced different interpretations of this striking phenomenon. Layard and Richter (1995) interpret wage arrears as a way to reduce wage costs without resorting to more costly layoffs in face of a general structural economic adjustment,[6] while Alfandari and Schaffer (1996) view them as a

[5]According to the latest rounds of the RLMS, wage arrears have dropped to 9 percent in 2000 and 7 percent in 2001.

[6]Social services provided by enterprises, employees' stakes in privatized en-

ploy by enterprises to extract government subsidies. Clarke (1998) emphasizes the widespread occurrence of liquidity constraints and barter arrangements. In a similar vein, Ivanova and Wyplosz (1999) point out that wage arrears are only one element of a wider arrears crisis with fiscal origins, involving payment and tax arrears. Enterprise managers prefer buying high-yielding short-term treasury bonds to paying wages or taxes. Lehmann et al. (1999) underline that enterprises get away more easily with not paying wages if workers have little outside options in the local labour market. Earle and Sabirianova (1999) develop this argument further, claiming that local labour market characteristics account for the persistence of wage arrears over several years. In their view, local network externalities imply a positive relationship between the employees' quitting probability and the incidence of wage arrears in other local firms. Once the labour market has settled in this 'bad' equilibrium, wage arrears perpetuate themselves and last over long periods.

These explanations have in common that wage arrears are tied primarily to the features other than worker characteristics. The detailed investigations of wage arrears by (Earle and Sabirianova 1999) and Lehmann et al. (1999) confirm this finding.[7] Table 7.1 reproduces some of these results, drawing on the sample of worker during 1994 to 1998. It shows random effects logit regressions of wage arrears on gender, age group, educational attainment, occupational code, ownership shares, job tenure, foreign or government ownership, round and state indicators. Wage arrears are associated with personal characteristics, like male gender, low skills, long tenure, and low ownership stake, but the bulk of the explanatory power comes

terprises, and the leverage of enterprises, as monopsonists in the labour market of one-company towns, on local and federal authorities are reasons for preferring wage to employment adjustments.

[7](Lehmann and Wadsworth 2002) analyse the contribution of wage arrears to the wage distribution and wage inequality, drawing on the 1994, 1996, and 1998 rounds of the RLMS. Using seven alternative methods, ranging from regression estimation to propensity score matching, they find that conventional measures of earnings dispersion would be one fifth to one third lower in the absence of arrears. They also find that the parameters of the counterfactual (ie no-arrears) wage distributions are very similar to the parameters of the observed wage distributions of non-arrears workers.

from regional, year, and firm characteristics.[8] They are highest in state firms, and decline with private and foreign ownership. Wage arrears are also more prevalent in regions with low economic activity, high government spending, low tax revenues and high tax arrears, and higher in rural than urban areas. Adding indicator variables for lagged wage arrears reveals strong persistence. Past wage arrears increase the probability of current wage arrears by 12 to 14 percent (Column 5 to Column 8). Wage arrears are not the result of low health status. In Column 7 to Column 10, I include the lagged values of two health indicators for the prime-age adults (health problem during the last month and self-rated health status). Both variables are insignificant, and subjective health status has the wrong sign. For the last regression, the sample is restricted to the working elderly, and again the lagged health indicators (functional limitations and chest pain) are insignificant.

7.2.2 Sample

The sample includes all individuals, aged 55 years or older, from the four rounds from 1994 to 1998 of the RLMS. It provides 4625 observations of elderly who live in a household with at least one worker, of which 2815 are women. In these families, close to one in two members are 55 years or older, about a quarter of which are working themselves. The analysis focuses on the health status of elderly for three reasons. First, in view of the changing pathways between economic and health status over the lifetime (Smith and Kington 1997), it is useful to concentrate on one particular age group. Second, about four fifth of the population aged 55 years or older are not in a regular employment. The vast majority of individuals active in the labour market retire at pension age (55 years for women, 60 years for men), unless they are forced into early retirement due to poor health or bad job prospects. By defining 55 years as the cut-off age, the bulk of the elderly's income comes from pensions or wage income of working-age household members. The health status of the

[8]Information on enterprise size is available for about 70 percent of the workers. Including this variable, the incidence of wage arrears increases with the number of employees, while other results remain unchanged.

Table 7.1: Worker random effects logit regressions of wage arrears incidence

	Coef (1)	z (2)	Coef (3)	z (4)	Coef (5)	z (6)	Coef (7)	z (8)	Coef (9)	z (10)	Coef (11)	z (12)
Wage arrears (t-1)			0.932	14.2	0.721	8.0						
Wage arrears (t-2)					0.416	4.2						
Any health problem last month (t-1)?							0.041	0.7				
Self-rated health (t-1)									-0.007	-0.2		
ADL (t-1)											-0.017	-1.1
Chest pain (t-1)											0.115	0.6
Male	0.201	4.5	0.151	2.5	0.103	1.2	0.174	2.9	0.167	2.7	0.371	1.6
Age (months)	0.0002	1.1	0.0003	1.3	0.0003	1.0	0.0003	1.4	0.0004	1.4	-0.0014	-0.7
Education (years)	-0.024	-2.8	-0.009	-0.8	-0.014	-0.9	-0.011	-1.0	-0.011	-1.0	0.007	0.2
Tenure (months)	0.0007	3.3	0.0003	1.0	0.0000	-0.1	0.0004	1.4	0.0004	1.4	0.0008	1.3
Occupational code	0.00004	3.6	0.00004	2.6	0.00001	0.6	0.00004	3.2	0.00004	3.2	0.00006	1.2
Emloyee's ownership (%)	-0.049	-1.3	-0.083	-1.5	-0.092	-1.1	-0.075	-1.4	-0.075	-1.4	-0.534	-2.0
Enterprise ownership (Fully public as omitted category):												
Some public	-0.239	-3.5	-0.259	-2.7	-0.285	-2.2	-0.266	-2.8	-0.264	-2.8	0.280	0.9
Fully private	-0.331	-5.9	-0.347	-4.3	-0.448	-4.1	-0.372	-4.7	-0.372	-4.7	-0.067	-0.2
State-level (Ruble per capita):												
Gross regional product	0.00000	-2.3	0.0000	-2.2	0.0000	-3.2	0.0000	-2.4	0.0000	-2.4	0.0000	-0.3
Government expenditure	0.00004	4.6	0.00002	1.6	0.00002	1.4	0.00003	2.1	0.00003	2.1	0.00001	0.3
Total tax revenues	0.0000	-0.8	0.0000	-1.0	0.00000	-0.1	0.0000	-1.0	0.0000	-1.0	0.0000	-1.0
Regional tax revenues	-0.0001	-4.2	0.0000	-1.4	0.00001	0.3	-0.0001	-1.9	-0.0001	-1.9	-0.0001	-0.6
Total tax arrears	0.00001	1.0	0.00006	2.2	0.00008	2.5	0.00006	2.4	0.00006	2.3	0.00007	0.9
Regional tax arrears	0.00008	2.1	0.0000	-0.1	-0.0001	-1.2	0.00000	0.0	0.00000	0.0	0.0000	0.1
Public enterprises closed?	0.05834	1.2	0.11179	1.7	0.28793	3.1	0.14313	2.2	0.14241	2.1	0.31118	1.4
Survey year (1994 as omitted category):												
1995	-0.147	-2.1	0.478	4.0			0.395	3.4	0.397	3.4	-0.473	-1.8
1996	0.370	4.6	0.888	7.8	0.870	6.3	0.826	7.4	0.824	7.4		
1998	-0.344	-3.4									-0.6437	-1.7
Settlement type (Urban as omitted category):												
Suburban	0.387	4.7	0.469	4.2	0.467	3.1	0.534	4.8	0.531	4.8	1.112	2.7
Rural	0.362	6.6	0.308	4.0	0.351	3.3	0.379	5.1	0.378	5.1	0.506	1.8
Regions (Moscow and St. Petersburg):												
Northern and North Western	0.201	1.2	0.045	0.2	-0.134	-0.4	0.039	0.2	0.043	0.2	-0.614	-0.8
Central and Central Black-Earth	0.035	0.2	-0.085	-0.4	-0.018	-0.1	-0.109	-0.5	-0.111	-0.5	-0.542	-0.9
Volga-Vaytski and Volga Basin	0.558	3.7	0.483	2.1	0.578	1.9	0.534	2.4	0.531	2.4	-0.212	-0.3
North Caucasian	0.133	0.8	0.070	0.3	0.401	1.2	0.048	0.2	0.047	0.2	-0.763	-1.1
Ural	0.031	0.2	-0.079	-0.3	0.021	0.1	-0.102	-0.5	-0.104	-0.5	-0.437	-0.7
Western Siberian	0.296	1.8	0.093	0.4	-0.169	-0.5	0.162	0.7	0.160	0.7	-0.074	-0.1
Eastern Siberian and Far Eastern	0.307	1.9	0.184	0.8	0.261	0.8	0.208	0.9	0.209	0.9	-0.581	-0.8
Constant	-1.3	-4.8	-2.0	-5.9	-1.8	-3.9	-1.7	-5.3	-1.7	-4.9	0.3	0.2
Observations (#)	15595		7811		3886		7811		7811		922	
Log likelihood	-7277		-3772		-2000		-3870		-3870		-436	

Notes: The dependent variable is an indicator variable of wage arrears. The sample includes all workers with primary jobs from 1994 to 1998.

elderly has therefore little impact on household wage income, which suggests that wage arrears may affect health outcomes, but not the other way around.[9] Finally, as discussed in the next section, the RLMS provides reliable objective measures of the elderly's health status.

7.2.3 Old Age Health

The analysis characterizes old age health in terms of inputs and outputs. Health inputs include intakes of food, calories, protein, and multivitamines, the use of medical services and medicine, and health behaviour.[10] Calories provide the energy required to maintain human life. A well-balanced diet is much more than adequate energy intake, as protein, vitamins, and minerals are essential for ensuring a healthy life at old age. Caloric needs decline with age due to the drop in metabolic rate and the decrease in physical activity. By contrast, the elderly still need nearly the same amounts of important nutrients. The nutrient intakes are measured with a personal, 24-hour individual recall of food consumption, converted by researchers at the University of North Carolina using specifically developed food conversion charts. Individuals also recorded any separate intake of food supplements during the last 7 days.

Measures of the usage of medical services include coverage by medical insurance, health treatments and prescriptions in response to a health problem during the last month, and preventive health care, like check-ups, during the last year. Health behaviour refers to alcohol drinking and smoking, and physical exercise through walking.

The medical literature has linked malnutrition to an impairment

[9]While male retirement age is 60 years, I retain men aged 55 to 59 years in the sample for three reasons. Almost one in four men in this age bracket are already in retirement. In view of the low male life expectancy, including this subgroup almost doubles the size of the male sample from 937 to 1810. Finally, applying the same age-brackets for men and women makes the two samples more comparable with regard to age. In any case, the main findings hold also for men aged 60 years or older. As discussed in Section 7.4.1, the main results are confirmed if the sample is restricted to non-working elderly only.

[10]Jensen (2002) studies the link between socioeconomic status, nutrition, and health among the elderly using mainly the 1995 round of the RLMS.

of cognitive functions (Kaplan et al. 2001). Wage arrears may also lead to psychosocial stress which negatively affects endocrine and immunological processes, and in turn the performance of the brain.[11] While it is not possible to separate these influences with this data and approach, I can derive the reduced-form impact of wage arrears on cognitive functions using two indicators.[12] The questionnaire includes an explicit memory test which measures how much of new information the elderly are able to recall both immediately and delayed after some interval of time. The interviewer reads out ten words, and then asks the elderly to reproduce as many words as she can remember. After five minutes, the elderly are asked again to recall these words. This world list test gives rise a percent retained score, which measures the amount of information recalled after some time. It lies between 0 and 1, with 1 indicating that the elderly remembered all 10 words both times. Such memory scores have been found be a good detector of dementia among the elderly (Schmand et al. 1997). In another explicit test of cognitive functions, the old age are asked to perform five consecutive algebraic subtractions.[13] The subtraction score equals to the integer values of 0 to 5, with 0 indicating that the respondent gives the wrong answer at the first subtraction, and 5 that she gives five correct responses.

Health outcomes cover functional limitations, chest pain, memory scores, mortality and self-reported health status. Functional limitations are measured by a summary score of the activities of daily living (ADL), already introduced in Section 6.4.3. The index is normalized between 0 and 1, and a higher value indicates more functional limitations. It gives proximate descriptions of the severity of health status

[11]The hypothesis is similar to the one advanced by Wilkinson (1996) that societal-level inequality has a direct impact on health through induced stress. Sapolsky (1993) shows that low-ranking male baboons have higher levels of glucocorticoids, apparently as a reaction to the chronic stress they experience by their low status. Jensen (2001) finds that individuals who are more concerned about job loss have higher blood pressure and are more likely to be reporting chest pains and other health problems.

[12]The RLMS included these questions only from 1995 onwards.

[13]The questions states "Tell me, please, what is the result of one hundred minus seven?", and then continues four times with this question: "And now subtract seven from this number one more time. What is the result?".

and the level of assistance by others required (Wolfson 2002). The elderly also report the incidence of chest pains during the last 12 months. While chest pains, associated with heaviness, pressure, or discomfort in the chest, may have many causes, it is an important indicator for a potential heart condition among the elderly, a leading cause of mortality. I also investigate the impact of wage arrears on the ADL scores and survival rates in the next round.

Self-reported health is measured by a categorical variable on health status, ranging from very good, good, average, to bad and very bad. About one third of the elderly ranked their health to be bad or very bad, and less than one in ten as good or very good. As is well known, differences in perceptions and reporting biases may compromise the comparability of subjective health measures for different population subgroups. For example, subpopulations with lower expectations for health, such as the elderly, or with less health knowledge, such as those with low socioeconomic status, may actually report themselves in better health compared to observed health status.[14] Nevertheless, such bias is less of a concern for assessing changes in health in response to an income shock among comparable subgroups. Furthermore, research shows the self-reported health is related to subsequent functional limitations and mortality (Deaton and Paxson 1998).

Overall, these indicators on nutrition, memory, health status and mortality, together with measures on health service utilization and health behaviour, provide a rich data source to explore the impact of wage arrears on old age health.

7.2.4 Estimation

The estimation strategy relies on two sources of variation in the incidence of wage arrears to identify the effects of non-payment of wages on old age health. First, there are large regional differences in wage arrears incidence. Non-payment of wages became systemic in some

[14]Sadana et al. (2002) compare age-standarized estimates for self-reported health across 46 countries for people aged 65 years and older. Russia ranks as the fifth lowest country. However, the authors conclude that the cross-population comparability of the data is limited.

regions, yet remained rare in others. While the bulk of the workers received wages in well-off states, the majority of workers incurred payment arrears in weak states. For example, out of the 32 states covered by the RLMS, 13 states, accounting for over two fifth of the workers, had wage arrears consistently below the national average. Second, within regions, the likelihood of incurring wage arrears varied by demographic, occupational and enterprise characteristics of workers.

The impact of wage arrears on old age health is identified with propensity score matching. The basic idea of the estimation strategy is to compare old age health of the elderly in households with wage arrears to suitable comparison elderly living in worker households without wage arrears. I use propensity scores of the probability of incurring wage arrears to group arrears and non-arrears observations. The identifying assumption is that there would have been no differences in old-age health for arrears and non-arrears households in the absence of wage arrears. The method does not require a structural model of wage arrears, and allows me to estimate the mean impacts for different population subgroups. The estimator can be implemented non-parametrically. The procedure removes bias in estimating treatment effects due to observable heterogeneity.

With wage arrears as the treatment variable, the first step involves specifying the equation determining the selection into arrears and non-arrears status. In the generic model outlined in Chapter 2, this corresponds to estimating Equation 2.5. The results were already presented in Table 7.1. Next, wage arrears are aggregated to the level of households. Households with wage arrears are those families where at least one member incurred wage arrears. Out of the sample of 4625 observations, 1295 are 'arrears elderly', 759 of whom are women. The propensity score for each observation is calculated as predicted value of the household-level equivalent of the logit regression of wage arrears for workers. With more than nine in ten households having at most two workers, the characteristics of up to two workers per household are included separately. While household wages and income as endogenous variables cannot be included, I add standard determinants of household resources and a range of individual, household and state characteristics as possible

proxies for otherwise omitted variables. They include gender, age, and education of non-working elderly; household size and household composition; economic determinants like asset ownership, housing characteristics, and land use and livestock holding; and state-level information on government expenditures, tax revenues, tax arrears, and gross regional product. The model is run separately for each year. As shown in Table 7.2, the results broadly reflect the findings of the regression on the incidence of wage arrears in Table 7.1.

The estimated propensity scores are then applied to construct the matched samples. To ensure observations come from the same gender, survey round, and age group, I split the elderly into a young (below 65 years of age) and old (65 years and older) subsample, and then match arrears elderly to non-arrears elderly within the same gender-year-age group category. I use spline-smoothing, which involves fitting a cubic spline of the propensity score to the outcome variable for the control group. Before matching, the propensity scores of the arrears elderly is about 0.18 points higher than for non-arrears elderly.[15] After matching, the average propensity scores across the two groups almost coincide.[16] From the initial sample, 37 out of the 1295 treated observations cannot be matched. The matched treated observations comprise 734 old age women and 524 old age men.

Matching leads to close similarity across the groups. The density functions after matching almost coincide over the entire support (figures 7.2 and 7.3), and there are no significant differences in the mean values of key independent variables after matching (Table 7.3).[17] Finally, per capita household income of the treatment elderly in the matched subsample for DIDM is one percent higher than the one of control elderly in the pre-intervention period.

[15]The estimated propensity scores for male elderly with and without wage arrears are, respectively, 0.414 (standard error of 0.206) and 0.241 (standard error of 0.160). For female elderly, the corresponding numbers are 0.406 (0.199) and 0.226 (0.157).

[16]The propensity score for both arrears and non-arrears old age men is 0.405 (0.20), and for arrears and non-arrears old age women 0.390 (0.184).

[17]"Level" refers to the arrears outcome and "impact" to the estimated difference between the arrears and non-arrears outcome.

Table 7.2: Household logit regression of wage arrears incidence

		1994		1995		1996		1998	
		Coef	z	Coef	z	Coef	z	Coef	z
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Demographics:	Household size (#)	0.006	0.0	-0.143	-1.1	-0.024	-0.2	0.163	1.2
	Members aged 0-17 (#)	0.228	1.4	-0.043	-0.2	-0.153	-0.9	0.078	0.4
	Members aged 18-59 (#)	0.164	1.3	0.233	1.8	-0.166	-1.4	-0.074	-0.6
Working?		-0.197	-0.2	0.462	0.5	-0.650	-0.7	0.299	0.3
If not working:	Male?	0.028	0.1	0.229	0.9	0.024	0.1	0.197	0.8
	Age (months)	0.000	0.3	0.001	0.6	-0.001	-0.6	0.000	0.1
	Education (years)	-0.033	-1.1	-0.012	-0.4	-0.013	-0.5	0.018	0.7
Housing:	Living space (sq meter)	-0.013	-2.0	0.008	1.4	0.005	1.0	0.009	1.4
	Central heating?	0.215	0.7	-0.628	-1.7	-0.203	-0.7	0.165	0.5
	Central water supply?	0.321	1.1	0.964	3.2	-0.055	-0.2	0.362	1.2
	Hot water supply?	-0.609	-2.8	0.395	1.6	0.434	1.9	0.497	2.0
	Metered gas or electric stove?	0.320	1.2	-0.657	-2.5	-0.579	-3.4	-0.149	-0.5
	Central sewerage?	0.086	0.2	0.065	0.2	-0.102	-0.3	-0.789	-2.3
Asset index		-0.128	-1.7	-0.276	-3.6	0.001	0.0	-0.236	-3.2
Agriculture:	Land use?	-0.253	-1.2	0.569	2.6	-0.121	-0.6	0.252	1.1
	Amount of land (sotkas)	0.020	3.4	-0.001	-1.3	-0.001	-0.5	0.000	0.0
	Livestock?	0.199	0.8	0.473	1.9	0.406	1.7	-0.635	-2.4
First worker:	Male?	0.301	1.6	0.313	1.7	0.163	1.0	0.344	1.8
	Age (months)	0.000	0.4	-0.001	-0.8	-0.001	-2.3	0.001	1.0
	Education (years)	-0.078	-2.6	0.006	0.2	-0.003	-0.1	-0.009	-0.3
	Tenure (months)	0.001	1.3	0.001	0.9	0.001	1.4	0.000	-0.1
	Occupational code	0.0000	-1.0	0.0000	1.3	0.0000	0.2	0.0001	1.6
	Emloyee's ownership (%)	-0.196	-1.3	-0.361	-1.9	0.023	0.2	0.149	1.0
	Enterprise ownership (Fully public as omitted category)):								
	Some public?	-0.003	0.0	-0.641	-2.3	0.480	2.5	0.315	1.2
	Fully private?	-0.082	-0.3	-0.962	-3.2	-0.050	-0.2	-0.590	-2.0
Second worker:	Another worker?	1.512	1.8	-1.542	-1.7	-1.735	-2.3	-1.332	-1.4
	Male?	-0.161	-0.6	0.540	2.0	0.055	0.2	1.289	4.3
	Age (months)	0.002	2.2	0.002	1.9	0.000	0.1	0.001	1.6
	Education (years)	0.061	1.5	-0.100	-2.3	-0.040	-1.2	-0.049	-1.1
	Tenure (months)	0.001	0.8	-0.002	-1.7	0.000	-0.3	0.000	0.2
	Occupational code	0.0001	1.2	-0.0001	-1.4	0.0000	-0.7	-0.0001	-2.2
	Emloyee's ownership (%)	0.479	2.2	-0.065	-0.4	-0.082	-0.4	-0.416	-2.4
	Enterprise ownership (Fully public as omitted category)):								
	Some public?	0.194	0.7	-0.201	-0.7	0.158	0.6	-0.576	-1.8
	Fully private?	-0.269	-0.8	0.059	0.2	0.705	2.1	-0.013	0.0
State-level:	Government expenditure	0.0001	3.8	0.0001	1.7	0.00005	1.3	0.0000	-0.5
(Ruble per capita)	Regional tax revenues	-0.0001	-1.9	0.0004	3.4	-0.0002	-2.4	-0.0001	-1.6
	Regional tax arrears	0.0004	1.2	-0.0019	-3.6	0.0000	-0.1	0.0004	3.1
	Total tax revenues	0.0000	-0.7	-0.0002	-5.8	0.00002	1.1	0.0000	-0.3
	Total tax arrears	-0.0001	-0.7	0.0009	4.1	0.0001	0.8	0.0000	-0.2
	Gross regional product	0.0000	-1.0	0.00000	-0.6	0.00000	0.6	0.00001	0.4
Settlement type (Urban as omitted category):									
	Suburban	0.290	0.8	1.086	2.8	0.807	2.4	1.158	3.1
	Rural	-0.031	-0.1	0.006	0.0	-0.048	-0.2	0.353	1.2
Constant		-1.8	-1.2	-0.4	-0.2	2.7	2.0	-1.2	-0.8
Observations (#)		1257		1173		1155		1040	
Log likelihood		-600		-532		-666		-523	

Notes: The dependent variable is an indicator variable of household wage arrears. The sample is restricted to worker households with elderly from 1994 to 1998.

Figure 7.2: Densities of propensity scores for old age men after matching

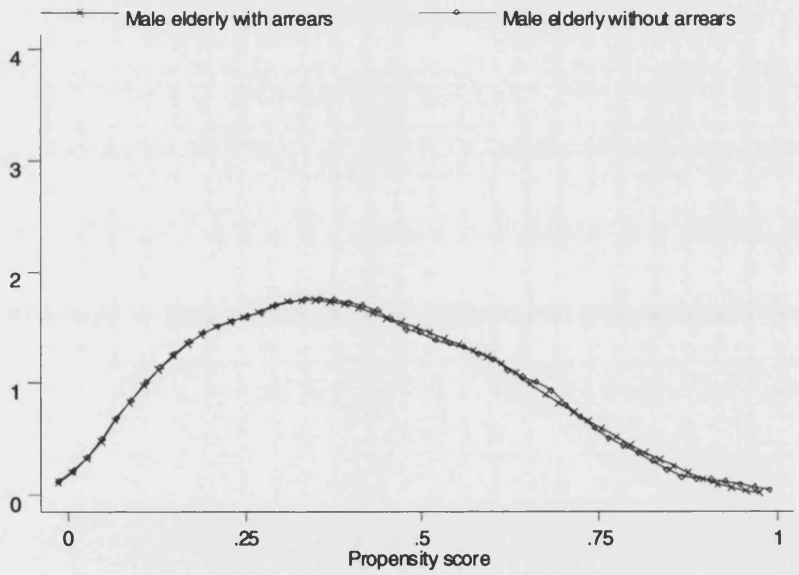


Figure 7.3: Densities of propensity scores for old age women after matching

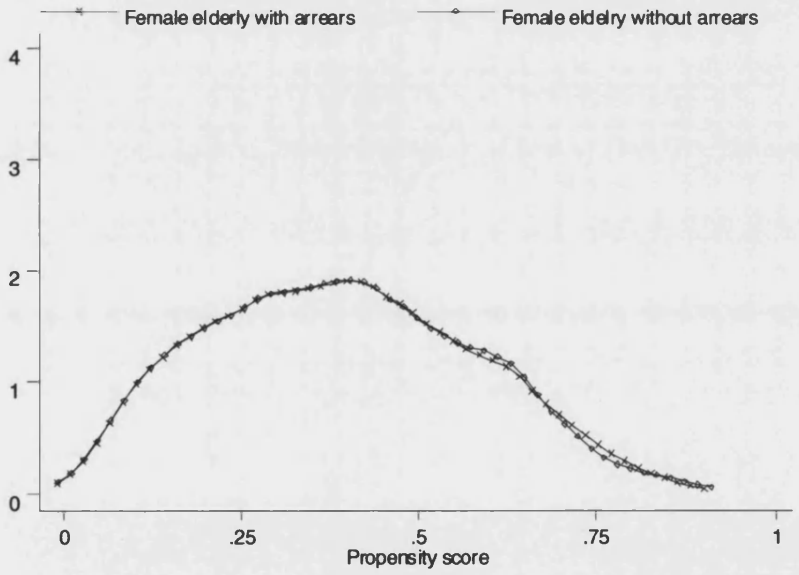


Table 7.3: Comparison of mean values of selected variables after matching

	Men				Women			
	Impact		Level		Impact		Level	
	Coef	t-st	Coef	SE	Coef	t-st	Coef	SE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Household size (#)	0.005	0.1	3.61	0.08	-0.037	-0.7	3.66	0.06
Working?	-0.005	-0.3	0.65	0.02	-0.008	-0.5	0.27	0.02
Age (months)	-1	-0.5	741	4	1	0.3	791	4
Education (years)	-0.20	-1.2	9.5	0.15	0.08	0.5	8.0	0.16
Assets (0-6)	0.003	0.0	3.61	0.05	0.007	0.2	3.54	0.05
Urban	-0.007	-0.4	0.380	0.02	0.008	0.5	0.388	0.02
Land (sotkas)	0.797	0.3	13.8	2.1	0.599	0.3	14.3	1.7
Livestock?	-0.023	-1.0	0.393	0.02	0.018	1.3	0.407	0.02
Total tax revenues	573	1.0	17137	625	-482	-1.1	15907	430
Total tax arrears	300	1.3	4316	284	-166	-1.1	3868	189
GRP	1656	1.2	73146	1754	-1284	-1.1	70142	1243
Observations (#)	1810				2815			

Notes: Elderly in arrears households are compared with elderly in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2.

7.2.5 Caloric Intake of Old Age Women

It is useful to compare alternative estimation approaches for one specific example. The following discussion looks at the impact of wage arrears on the caloric intake of old age women. Table 7.4 presents impact estimates of non-parametric matching estimations, and Table 7.5 shows findings from parametric regression analysis.

Elderly in Worker Households

Aligning arrears elderly to non-arrears elderly of households with workers according to the observable characteristics listed in Table 7.2 suggests that calories fell by 87 kcal, or about 6 percent of the non-arrears level (Panel A, Column 4 of Table 7.4). The differences in nutrition could reflect differences in economic endowments between arrears and non-arrears groups unrelated to wage arrears. This can be further explored by drawing on the longitudinal dimension of the data set. Panel B includes the old age women with both current and lagged observations. Female elderly are matched with regard to the same characteristics lagged by one period, in addition to lagged nutrition and health measures (caloric intake, functional limitations, obesity, chest pain, smoking and drinking). While caloric intake was almost identical in t-1, the wage arrears group consumed about 85 calories less than the non-arrears group in t.

However, the persistence of wage arrears implies that already in t-1 wage arrears elderly had a higher incidence of nonpayments of wages than the control group (Column 7 of Table 7.4). Panel C limits the sample to two groups: households without wage arrears in both periods (control group) and households without wage arrears in t-1 and wage arrears in t. This corresponds to the DIDM estimator. As for Panel B, the groups are matched according to the pre-intervention characteristics, including nutrition and health variables. The identifying assumption is that in the absence of the arrears crisis the paths of caloric intake would have been the same for the two groups. The control group had lower caloric intake in t-1 and higher caloric intake in t, raising the impact estimate to -135 calories.

Panel D uses female elderly represented in three consecutive rounds

Table 7.4: Wage arrears and caloric intake of old age women

		Caloric Intake				Wage Arrears				Caloric Intake				Wage Arrears		
	#	t-2	t-1	t	Diff.	t-2	t-1	t	#	t-2	t-1	t	Diff.	t-2	t-1	t
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Control group	***Worker households***								***Non-worker households***							
A. Matching																
Wage arrears	734			1441				1	690			1427				1
No wage arrears	2056			1528				0	1053			1508				0
Difference				**-87**				1				**-81**				1
				(3.8)								(3.7)				
B. Matching t-1																
Wage arrears	401		1501	1471			0.45	1	374		1297	1124			0.41	1
No wage arrears	997		1496	1556			0.28	0	401		1323	1176			0	0
Difference			5	**-85**			0.17	1			-26	**-52**			0.41	1
				(2.6)								(2.4)				
C. DID Matching																
Wage arrears	221		1543	1460	-83		0	1	227		1419	1110	-309		0	1
No wage arrears	801		1496	1548	52		0	0	396		1322	1140	-182		0	0
Difference			47	-88	**-135**		0	1			97	-30	**-127**		0	1
					(2.8)								(2.9)			
D. DID Matching t-2																
Wage arrears	103	1478	1608	1483	-125	0	0	1	92	1530	1565	1462	-103	0	0	1
No wage arrears	388	1464	1629	1582	-47	0	0	0	231	1534	1492	1476	-16	0	0	0
Difference		13	-21	99	**-79**	0	0	1		-4	73	-14	**-87**	0	0	1
					(1.1)								(1.2)			

Notes: The caloric intake of old age women in arrears households is compared with the one of old age women in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. In columns 1 to 8, the control group are households with workers without arrears. In columns 9 to 16, the control group is households matching based on without workers. Panel A applies cross-sectional matching based on characteristics at time t; Panel B applies cross-sectional characteristics at time t-1; Panel C applies DID matching based on characteristics at time t-1; and Panel D applies DID matching based on characteristics at time t-2.

to conduct a pre-test of the identifying assumption of the last estimation. The treatment group is composed of elderly women without wage arrears in t-2 and t-1, and wage arrears in t; and the control group of elderly women without wage arrears in the three periods, matched on the standard characteristics in t-1 in addition to nutrition and health variables in t-1 and t-2. Caloric intake increased for both groups from t-2 to t-1, and then dropped sharply from t-1 to t for the treatment group, and only moderately for the control group. This excess reduction of caloric intake is indicative of the impact of wage arrears.

Elderly in Non-Worker Households

The discussion so far concentrated on worker households, as only those could directly have been affected by wage arrears. Yet, about two in five elderly live in households without workers. While wage arrears affected only some worker households, there might have been other labor market specific shocks, such as job losses or falling wages, that affected worker households in general. Furthermore, the non-arrears group in worker household could be contaminated by the arrears crisis through substitution and equilibrium wage effects. For example, workers in non-arrears households might have been affected by job losses if enterprises would have cut costs not by wage arrears but by shedding labor. Comparing impact estimates across the worker and non-worker control group provides a simple test for the net effect of such influences.

There are important differences among elderly in worker and non-worker households that have to be balanced through matching. In particular, elderly in non-worker households are on average about 3.5 years older, have 1.5 years less education, and have 1.5 fewer co-members than elderly in worker households. Since these elderly reside in non-worker families, I replace the worker-specific characteristics of Table 7.2 with age, gender, and education characteristics of the working-age members in the non-worker households. Next, I predict the propensity score of the elderly living in non-worker households based on the estimated logit regressions of elderly living in worker households, and use the propensity score to match

the elderly living in non-worker households to wage arrears elderly. The results are shown in columns 10 to 16 of Table 7.4. The impact estimates are broadly similar to those using worker households as control group, suggesting that the non-arrears elderly in worker households were subject to similar economic environment as elderly in non-worker households, or that the alternative labor market factors cancel each other out.

Regression Analysis

The matching estimator can be integrated in a parametric set-up. This allows the researcher to identify the impact of treatment on the treated over the whole support of X. In the linear specification $H_{it} = X_{it}\beta + \alpha_L A_{it} + u_{it}$, where u as error term uncorrelated to X, the coefficient α_L on A gives the impact of wage arrears. In order to focus on the within-region variation in wage receipts, the regressions include region and region*year indicators. The first estimation includes only basic non-income regressors, and the second adds asset variables. As shown in columns 1 and 2 of Table 7.5, the random-effects model suggests a statistically significant and negative impact of wage arrears on caloric intake of old age women for the sample of worker households.

The next estimation extends this framework to the Difference-In-Differences setting, where the sample is restricted to female elderly in worker households without arrears in both periods (the control group with $A_i = 0$), or arrears only in the post-intervention period $I = 1$ (the treatment group with $A_i = 1$). Then $H_{it} = X_{it}\beta + A_i + I_t + \alpha_{LD} A_i * I_t + u$, where α_{LD}, the interaction term between arrears and post-intervention period, captures the arrears impact. The point impact estimate of wage arrears is slightly higher then before and statistically significant.

The last estimation regresses the change in caloric intake on whether female elderly went into wage arrears from pre- to post intervention period, and changes in all other characteristics. This procedure eliminates unobservable, fixed differences. The impact estimate is similar than before and statistically significant.

The final four regressions pursue a slightly different specification.

Table 7.5: Regressions of caloric intake of old age women

		RE (1)	RE (2)	DID (3)	FE (4)	RE (5)	IV-RE (6)	FE (7)	IV-FE (8)
Wage arrears		-65	-67	-82	-79				
		-2.5	-2.6	-1.6	-2.0				
Household income (per capita)						0.013	0.072	0.005	0.131
						2.4	2.5	0.5	1.8
Demographics:	Household size (#)	34	6	17	-126	9	28	-130	-25
		1.4	0.3	0.7	-2.0	0.4	1.1	-2.0	-0.3
	Members aged 0-17 (#)	-36	-20	-52	112	-18	-10	113	38
		-1.3	-0.7	-1.5	1.4	-0.6	-0.4	1.4	0.4
	Members aged 18-59 (#)	-20	-14	-12	122	-16	-24	127	49
		-0.8	-0.6	-0.5	2.0	-0.7	-1.0	2.1	0.6
Working?		17	27	-4	-48	18	-14	-50	-79
		0.5	0.9	-0.1	-0.6	0.6	-0.4	-0.6	-0.9
Age (months)		-0.98	-0.97	-0.92	2	-0.98	-1.02	2.40	1.38
		-6.8	-6.8	-4.9	0.8	-6.9	-7.1	0.8	0.4
Education (years)		9.6	8.0	10.6	-32	7.6	5.0	-30.6	-29.6
		2.9	2.3	2.6	-2.4	2.2	1.4	-2.3	-2.0
Housing:	Living space (sq meter)		3	2	-1	3	2	-1	-2
			2.8	1.7	-0.4	2.7	2.4	-0.4	-0.9
	Central heating?		-62	-7	-189	-58	-50	-189	-210
			-1.1	-0.1	-1.9	-1.1	-0.9	-1.9	-2.0
	Central water supply?		12	47	133	7	-3	113	110
			0.3	0.8	1.3	0.2	-0.1	1.2	1.0
	Hot water supply?		30	68	155	23	-2	149	81
			0.8	1.6	1.8	0.6	0.0	1.7	0.8
	Metered gas or electric stove?		-3	16	43	2	5	52	101
			-0.1	0.4	0.6	0.1	0.1	0.7	1.2
	Central sewerage?		-18.5	-92	-258	-19	-16	-252	-315
			-0.3	-1.3	-1.6	-0.3	-0.3	-1.6	-1.8
Asset index			24	8	4	22	6	8	17
			2.1	0.6	0.2	1.9	0.4	0.3	0.6
Agriculture:	Land use?		7	21	-75	3	6	-83	-92
			0.2	0.6	-1.0	0.1	0.2	-1.1	-1.2
	Amount of land (sotkas)		0.29	0.14	0	0.29	0.25	0.22	0.17
			3.4	2.0	2.1	3.3	2.7	2.2	1.5
	Livestock?		92	75	101	87	77	103	78
			2.3	1.5	1.2	2.2	1.9	1.2	0.8
Settlement type (Urban omitted category):									
	Suburban	-34	-115	-214		-124	-109		
		-0.5	-1.7	-2.4		-1.8	-1.6		
	Rural	71	-33	47		-37	-42		
		2.1	-0.7	0.8		-0.8	-0.9		
Year (1994 as omitted category):									
	1995	-56	-59	163		-48	-10	57	
		-0.6	-0.7	1.7	0.0	-0.5	-0.1	0.4	
	1996	-148	-147	-7	57	-145	-107	-78	
		-1.6	-1.6	-0.1	0.4	-1.6	-1.1	-0.6	
	1998	-5	-15	306	-68	8	122		
Treatment group				-14					
				-0.3					
Post-intervention				-5					
				-0.2					
Observations (#)		2805	2805	2034	2805	2805	2805	2805	2805

The regressions include indicators for regions and region*year interactions. The sample is restricted to old age women in worker households. In Column 3, wage arrears represent the interaction of treatment group and post-intervention dummies. In columns 6 and 8, household income is instrumented by the wage arrears indicator.

The idea is to identify the impact of wage arrears on caloric intake by capturing the variation in household income due to wage arrears. Per capita household income is included both directly and instrumented by the wage arrears indicator. In the non-instrumented version, it is significant in the random effects specification but insignificant in the fixed effects regression. Once instrumented, the coefficient is significant in both specifications. As shown later, wage arrears lead to a reduction in per capita household wages by about R900. This suggests a reduction of around 65 calories for the IV random effects regression, similar to the findings of the first two columns, and of around 118 calories for the IV fixed effects regression, slightly higher than the previous estimates.

7.2.6 Alternative Matching Functions

Table 7.6 compares the impact of wage arrears on key variables for cross-sectional spline smoothing matching to three other matching estimations. To eliminate the impact of differential regional trends, one set of estimates refers to spline smoothing matching where treated observations are matched only to observations within the same state. The other two procedures are Epanechnikov kernel matching, which weighs control elderly according to the Epanechnikov function, and nearest neighbour matching, where each treated observation is paired with the control observation with the closest propensity score.

The main results are confirmed by three alternative matching procedures. Columns 3 and 4 refer to spline smoothing matching where treated elderly are matched only to elderly who reside in the same state. The number of matched elderly drops from 524 to 274 for men, and from 734 to 513 for women. The estimated impacts on wages, caloric intake, and ADL scores are larger. With the exception of the female calorie coefficient, the significance of the coefficients is lower due to smaller sample size. The Epanechnikov approach (Columns 5 and 6) retains slightly fewer treatment observations than spline smoothing, and the findings are very similar. The nearest neighbour method (Columns 7 and 8) allows only matches where the difference in the propensity score is no larger than the absolute value

Table 7.6: Wage arrears, wage income, caloric intake, and functional limitations: Matching technique

	Spline smoothing				Epane-chnikov		Neareast Neighbor	
	Any state		Same state					
	Coef	t-st	Coef	t-st	Coef	t-st	Coef	t-st
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Old-age men								
Wage per capita	-968	-20	-1072	-9	-943	-18	-997	-9.2
Caloric intake	-91	-2.2	-92	-1.6	-76	-2.0	-94	-1.5
ADL	0.018	2.2	0.031	2.0	0.018	1.9	0.016	1.1
Matched observations (#)	524		274		513		378	
Old-age women								
Wage per capita	-896	-23	-932	-17	-925	-29	-913	-12
Caloric intake	-81	-3.6	-115	-3.9	-81	-3.3	-91	-2.5
ADL	0.010	1.2	0.012	0.6	0.013	1.6	0.002	0.1
Matched observations (#)	734		513		729		658	

Notes: Elderly in arrears households are compared with elderly in non-arrears households according to alternative cross-sectional matching techniques, based on the propensity scores derived from the logit regressions of Table 7.2. Columns 1 and 2 apply spline smoothing matching; columns 3 and 4 apply spline smoothing matching, where arrears elderly are matched to non-arrears elderly only within the same state ('oblast'); columns 5 and 6 apply Epanechnikov matching; and columns 7 and 8 apply Neareast-Neighbor matching.

of 0.01, which reduces the number of matched treated men to 378, and matched treated women to 658. Again, the impact estimates are comparable to the spline smoothing method.

7.2.7 Identification

Selective Migration

Workers may seek to relocate from high- to low-arrears regions in search of a better job. Table 7.7 shows impact estimates of wage arrears on moving, attrition, and job tenure for workers living in households with elderly, based on the logit regressions of Table 7.1. Overall, about 18 percent of the workers drop out of the survey in the next round. About one third of them moved away, and for the bulk of the others the cause of the attrition is missing.[18] For missing observation and relocation, the dropout rate of workers with wage arrears is no higher than for those without wage arrears. Turning to job changes since end 1993, the beginning of the wage arrears crisis, more than two thirds of the workers were employed in their current job already before 1994. The job mobility of workers with wage arrears is no higher than those without wage arrears. This suggests that selective job switching and migration are not important concerns for the empirical analysis.

A number of factors can explain why selective job switching and migration are not important concerns for the empirical analysis.[19] Why do workers not quit to take up employment at other firms? As mentioned above, workers in depressed areas often lack outside options and face high mobility costs. In addition, access to social services and other fringe benefits provided by the enterprise are at risk when changing jobs. Furthermore, in view of the general lack of contract enforcement, workers may fear to lose any chance to recover their back-wages owed when they quit the enterprise. Finally, resettlement is costly, both financially (about 19 in 20 elderly own the apartment they live in) and socially (local network of relatives,

[18]Information on individuals missing from the previous survey round is provided by the remaining household members. If the entire household drops out of the survey, then no information on the cause for attrition is available.

[19]They mirror those of Chapter 6.4.2.

Table 7.7: Wage arrears, worker attrition and job tenure

	Men		Women	
	Coef (1)	t-st (2)	Coef (3)	t-st (4)
Moved away (t+1)?	0.011	0.8	-0.006	-0.5
Missing observation (t+1)?	0.010	0.7	-0.012	-1.1
Job tenure since end 1993?	0.015	0.8	-0.027	-1.1
Observations (#)	2556		2507	

Notes: Workers with wage arrears in households with elderly are compared to workers without wage arrears in households with elderly according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. The coefficients are impact estimates of wage arrears on workers with wage arrears.

friends, and colleagues), and many households may simply not be able to cover the moving expenses (Andrienko and Guriev 2002).[20] These reasons are likely to be especially applicable to wage earners in households with elderly, as they are typically themselves either

that trigger a rise in morbidity and mortality. First, the matching procedure accounts for regional and fiscal factors ensuring that arrears households are paired with non-arrears households from similar areas. Second, I study the impact of measures directly to see whether they can account for a lower health status of arrears elderly. The most obvious issue is whether additional social spending and pension were lost to arrears households. The RLMS reports on a number of such programs. As shown in the top part of Table 7.7, the differences in outlays between arrears and non-arrears elderly are too small to be economically important. The total effect on government benefits is statistically insignificant and amounts to no more than one percent of household income.

Pollution A further possible cause for the worsening in old-age health is pollution of the environment. More than two thirds of the Russian population live in areas affected by air pollution at levels that exceed health and safety standards. While as a result of the decline in industrial production levels of air pollution declined from stationary sources, the rise in the number of motor vehicles led to worse air quality in towns with heavy traffic. Approximately one third of the samples taken from piped water supplies do not meet hygiene standards in terms of chemical indicators (Ministry of Health 1999).

While there is no objective information on exposure to pollution, the RLMS asked the elderly to assess changes in a range of environmental factors, as shown in the bottom part of Table 7.8. The focus is on exploring whether the treatment elderly, compared to the control group, experienced an environmental deterioration that may have contributed to worse health outcomes. There was widespread concern about environmental pollution. Almost six in ten elderly attributed a chronic illness of a family member to bad environmental conditions in their neighbourhood. In the twelve months preceding the survey, about one in five elderly felt that garbage collection deteriorated, compared to three in ten for air quality, and almost four in ten for water quality. About one third used a new method for cleaning drinking water, and one in sixteen for cleaning air. Four in ten elderly would be willing to pay higher taxes for clean air or

Table 7.8: Wage arrears, government transfers and self-rated environment

	Men		Women	
	Coef (1)	t-st (2)	Coef (3)	t-st (4)
Government transfers (per capita)				
All benefits	12	0.4	-16	-0.7
Pensions	23	0.8	-5	-0.2
Unemployment benefits	0	-0.1	-2	-3.7
Child benefits	0	0.0	-8	-2.8
Fuel benefits	-6	-3.9	2	1.1
Apartment benefits	-2	-1.2	-3	-3.3
Grants	-3	-1.9	-2	-1.2
Environment				
Family member ill due to pollution?	-0.059	-1.8	-0.031	-1.1
Worse garbage collection	-0.010	-0.5	-0.027	-1.4
Worse air quality	-0.012	-0.5	0.041	2.1
New method for cleaning air?	0.010	0.9	-0.017	-2.1
Worse water quality	0.006	0.3	-0.007	-0.4
New method for cleaning drinking water?	-0.016	-0.7	-0.018	-1.0
Willing to pay tax for clean air or water?	-0.029	-1.3	-0.029	-1.7
Observations (#)	1810		2815	

Notes: The elderly in arrears households are compared to the elderly in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. The sample is restricted to worker households. The coefficients are impact estimates of wage arrears on the elderly in arrears households.

water in return.

Compared to the control group, the elderly in wage arrears households believe that environmental conditions have either improved, or changed little over the 12 months preceding the survey. The only exception is air pollution, which is rated by old age women in the treatment group as about 2 percent worse than by those in the control group. However, this deterioration did not lead arrears households to adopt new methods for cleaning air, suggesting that air pollution may not have worsened severely. Furthermore, the incidence of chronic diseases of family members due to pollution is lower than among non-arrears families. Finally, the arrears elderly were less willing to pay the government for clean air or water. This could reflect either a more positive evaluation of environmental conditions, or a reduction in demand for clean air and water due to lower household income. Overall, based on these assessments, the arrears elderly were not exposed to systematically higher pollution.

7.3 Results

7.3.1 Economic Impact

The wage arrears crisis had a dramatic effect on living standards. Table 7.9 displays components of per capita household income of old age men and women with wage arrears and the impact on the treatment group as identified by matching estimation. Arrears households are estimated to have lost about R900 to R1,000 per capita (PPP$360 to PPP$400), or two thirds of the wage income, and over one third of household income. Income poverty more than doubled, implying that over four in ten arrears elderly had not enough resources to cover basic food and non-food needs. The reduction of household income in absolute terms was only 2 percent lower than the wage loss, suggesting that households were not able to compensate for reduced wage receipts from other sources. Turning to other sources of household income, as already discussed, government transfers hardly changed. While income from home production increased moderately, about two thirds of these gains were wiped out through a decline in financial income. Even though the absolute levels of wages and

household income declined slightly less for women than men, the relative drop was slightly larger, and more women fell into poverty as they were economically less well off. Female elderly also suffered a larger reduction in financial income, but managed to increase home production about three and a half times as much as male elderly.

Table 7.9: Wage arrears and living standards (Ruble per capita)

	Men				Women			
	Impact		Level		Impact		Level	
	Coef (1)	t-st (2)	Coef (3)	SE (4)	Coef (5)	t-st (6)	Coef (7)	SE (8)
Wages	-968	-20	571	45	-898	-25	441	28
Government transfers	12	0.4	728	36	-16	-0.7	699	22
Home production	21	0.4	493	59	92	2.3	461	40
Financial income	-12	-1.1	20	9	-63	-6.0	16	6
Income	-947	-10	1813	85	-884	-14	1617	64
Income poverty (%)	0.218	10	0.416	0.020	0.254	14	0.477	0.019
Observations (#)	1810				2815			

Notes: The elderly in arrears households are compared to the elderly in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. The sample is restricted to worker households. The coefficients in columns 1 and 5 are the impact estimates of wage arrears on the elderly in arrears households. The coefficients in columns 3 and 7 are the level estimates for the elderly in arrears households.

7.3.2 Coping Strategies

The previous discussion suggests that households were not successful in mitigating the impact of wage arrears through generating income through other channels. Table 7.10 takes a closer look at three types of responses, namely labour supply, sales and borrowing, and private transfers. Male elderly compensated no more than 12 percent, and

female elderly 9 percent of the wage reduction. Taking into account the changes in other income sources (government transfers, home production and financial income), the net resource loss equalled 86 percent of the wage shocks for men and 90 percent for women.

Table 7.10: Wage arrears and household coping strategies

	Men				Women			
	Impact		Level		Impact		Level	
	Coef (1)	t-st (2)	Coef (3)	SE (4)	Coef (5)	t-st (6)	Coef (7)	SE (8)
Income with private transfers, sales and borrowing (per capita)	-831	-9.8	1873	72	-805	-12	1758	54
Employment (per worker)								
Jobs (#)	-0.05	-3.3	1.1289	0.01	-0.01	-1.0	1.131	0.01
Hours worked last month	-9.5	-3.0	157	3	-4.0	-1.3	160	2
Hours spent working last week	-3.4	-3.8	42	0.8	-1.8	-2.4	42	0.8
Private transfers								
Private transfers given?	-0.12	-5.4	0.4828	0.022	-0.06	-3.2	0.465	0.018
Transfers given if given (per capita)	-67	-0.8	660	78	4	0.1	585	79
Private transfers received?	-0.02	-1.7	0.0992	0.014	-0.02	-2.0	0.121	0.011
Transfers received if received (per capita)	-5	0.0	624	180	-91	-0.6	545	138
Net transfers received (per capita)	80	1.7	-262	53	-9	-0.2	-202	37
Sales and borrowing								
Sold jewelry or property?	0.010	0.9	0.3	0.021	0.005	0.5	0.317	0.016
Borrowing?	0.057	3.4	0.1851	0.017	0.050	3.1	0.205	0.013
Unpaid rent or utility bills?	0.065	3.5	0.2252	0.016	0.057	3.8	0.236	0.016
Sales, borrowing, unpaid bills (per capita)	36	1.0	321	39	88	2.4	344	34
Observations (#)	1810				2815			

Notes: The elderly in arrears households are compared to the elderly in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. The sample is restricted to worker households. The coefficients in columns 1 and 5 are the impact estimates of wage arrears on the elderly in arrears households. The coefficients in columns 3 and 7 are the level estimates for the elderly in arrears households.

Labour Supply

Standard labour supply theory predicts that a decline in income should lead to a reduction in the demand for leisure and thus an increase in labour supply. To the extent that wage income is shared among household members, the wage arrears shock could affect labour supply of all adult members of the treatment household. In arrears families almost every other member is employed, and each worker

holds about 1.1 formal or informal jobs. The top part of Table 7.10 shows that total number of job holdings per worker actually declined in arrears households relative to non-arrears households. The drop in job holdings led to a reduction in the total number of hours worked per worker during the last month and last week (from the time use section of the RLMS).[21] The impact was larger on male arrears elderly, with a per worker reduction of 0.05 jobs, and 2.5 to 3.5 week hours worked, compared to 0.01 jobs, and 1 to 2 week hours for female arrears elderly.

However, the lack of a labour supply response is likely to be related to the dire job market situation rather than an unwillingness to find jobs. Unemployment rates were close to 10 percent, and workers shared a pessimistic assessment of the job market. About two in three workers were concerned about losing their job, and seven in ten workers said it was "absolutely uncertain" or "fairly uncertain" that they would find another job in case of job loss, while only 16 percent believed it is "absolutely certain" or "fairly certain".

Private Transfers

If members of different households care about each others consumption, a decline in income of one family should trigger an increase in transfers received from other households. Private transfers were widespread. Almost six in ten elderly lived in households that receive or give transfers. The vast majority of transfers occurred among family members and friends. Transfers given and received amounted to about one fifth of household income for participating families. The elderly gave more than they receive, so the net effect was a redistribution of income of about 10 percent of the elderly's income, in many cases probably from parents to children.

As shown in the middle part of Table 7.10, inter-household transfers declined in response to wage arrears. For the male elderly, the percentage giving transfers dropped by 10 percent more than those receiving transfers. In addition, in Ruble per capita, transfers given also fell by more than transfers received, leading overall to a net

[21] Wage arrears have no impact on the number of hours worked in the job for which wages are outstanding.

gain of R80, or 8 percent of the wage arrears shock. Relative to their male counterparts, the female elderly continued to give more, and give more frequently, and suffered from larger losses in transfers received. Overall, the elderly women living in arrears households experienced a modest reduction in net transfers, so that private transfers provided no cushion against wage arrears. The differential impact on male and female elderly could reflect differences in preferences, like altruism of old age women, or, alternatively, a larger exposure to wage arrears of households that engaged in private transfers with female elderly.

Sales and Borrowing

Permanent income and life-cycle theories of consumption predict that a negative income shock should lead to dissaving or borrowing in order to bring consumption in line with the lower level of permanent income.[22] Due to a legacy of high inflation, difficult economic transition and fragmented financial institutions, few Russian households had any savings, and most assets were held in illiquid forms like property. For example, less than one in 11 households report having any money savings. As shown in the lower part of Table 7.10, arrears households increased the sales of jewellery and property by about 3 percent compared to non-arrears households, but the difference is not statistically significant.

Households also increase borrowing in response to arrears. Overall, the share of families engaged in borrowing rose by around 5 percentage points, so that one in five arrears elderly lived in families who borrowed. Finally, an indirect form of borrowing is to run up payment arrears. The RLMS recorded whether households were in delay of rent and utility payments. The incidence of overdue payments increased by 6 percentage points, implying that almost one in four arrears elderly lived in families that owed rent and utility bills. Overall, sales and borrowing rose by 4 percent of the wage shock for

[22]While expectations are difficult to measure, two thirds of the elderly with arrears believed their family would live somewhat or much worse in the next 12 months than today, and another 30 percent expected nothing to change. This distribution changes by little over the course of the wage arrears crisis.

men, and 10 percent of the wage loss for women.

7.3.3 Health Impact

The preceding section documented that arrears elderly experienced a drop of about 40 percent of household income and a doubling of poverty. This section investigates the health implications of this income shock, in line with the analysis of Section 6.4. I take a closer look at health services and health behaviours in Table 7.11, at food and nutrition in Table 7.12 and Table 7.13, and at cognitive functions and health outcomes in Table 7.14.

Health Service

The bulk of the health service is funded through the compulsory medical insurance system, which levies a 3.6 percent payroll tax for private sector employees, in addition to transfers from the federal and local budgets for the non-working population and government employees. Some medical institutions are also directly funded by the federal or local budgets, or owned and run by enterprises. As a result, basic health care is free of charge, even though the system is chronically underfunded (Gorban and Yudaeva 1999 and Davis 2001).[23]

Access to health services was no worse for arrears elderly than non-arrears elderly. As the top part of Table 7.11 shows, about four in ten old age men, and two thirds of the old age women, had health problems during the last month. Among those, between 30 to 40 percent received prescriptions, or went to see a doctor, most of whom were public doctors, and almost nobody paid for the treatment. Just over one in ten elderly received a general health check up over the last three months, and, again, most elderly did not pay. Based on these access indicators, the wage arrears crisis was not accompanied by a deterioration in health services provided to arrears elderly.

[23]In 1995, per capita health expenditure in the USA (US$3,756) was twenty-five times higher than that in Russia (US$148).

Table 7.11: Wage arrears, health service access and health behaviour

	Men				Women			
	Impact		Level		Impact		Level	
	Coef (1)	t-st (2)	Coef (3)	SE (4)	Coef (5)	t-st (6)	Coef (7)	SE (8)
Health service								
Health problem last month?	0.018	0.8	0.426	0.0222	0.004	0.3	0.665	0.017
Prescription if health problem last month?	-0.013	-0.4	0.386	0.033	0.005	0.2	0.318	0.020
Treatment if health problem last month?	-0.006	-0.2	0.371	0.034	-0.007	-0.3	0.358	0.021
Public doctor, if treatment?	0.006	0.1	0.779	0.055	-0.017	-0.4	0.632	0.038
Paid if treatment last month?	0.002	0.1	0.044	0.023	-0.004	-0.4	0.015	0.010
Went for check-up last 3 months?	-0.013	-0.8	0.124	0.015	-0.005	-0.4	0.104	0.011
Paid if check-up?	-0.049	-2.3	0.021	0.021	-0.047	-1.5	0.056	0.031
Medical Insurance?	0.039	1.9	0.607	0.022	0.014	0.9	0.534	0.019
Health behaviour								
Smoker?	-0.011	-0.5	0.452	0.022	-0.013	-3.5	0.010	0.003
Cigarettes if smoker (# per day)	-0.2	-0.5	7.2	0.4	-0.1	-1.9	0.1	0.1
Smoking (years)	0.50	0.5	28	1	-0.24	-1.5	0.7	0.2
Alcohol drinker?	-0.068	-3.3	0.626	0.020	-0.028	-1.8	0.255	0.016
Alcohol consumed if drinker (g per day)	-1.8	-0.5	23	3	0.1	0.3	1	0
Walking (minutes per day)	5.3	0.6	213	10	4.2	0.5	186	7
Observations (#)	1810				2815			

Notes: The elderly in arrears households are compared to the elderly in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. The sample is

Health Behaviour

Habits regarding smoking and drinking can directly impact old-age health. Heavy drinking and smoking contributes strongly to the risk of both cardiovascular diseases and accidents and poisoning, the two leading causes according to official mortality statistics. As shown in the bottom half of Table 7.11, there is a large difference between elderly men and women. While almost every other male elderly smokes, fewer than one in fifty female elderly smoke.[24] Elderly men have smoked on average for 28 years, compared to less than one year for elderly women. About seven in ten elderly men drink alcohol, compared to less than three in ten women.[25] Among those drinking, old age men drink on average one bottle of vodka every 40 days, compared to one bottle every three years for women.

The wage arrears crisis led to more healthy smoking and drinking habits among the elderly. About one percent of men and women quit smoking, and 3 to 7 percent stopped drinking. Among those elderly who continued smoking and drinking, consumption remained unchanged or decreases slightly. Physical activity is another important input into health. The only type of movement for nine in ten elderly was walking, which accounted for 3 to 3.5 hours during the day. The time spent walking increased by 5 minutes per day in response to wage arrears.[26]

Overall, these findings suggest that changes in health behaviour may have mitigated any negative impact on nutrition and health outcomes from the decline in household resources, but the effect is likely to have been modest. The adjustments may be the direct result of the income shock, in order to economize expenses by cutting down smoking and drinking. Alternatively, they may represent a response

[24]By comparison, 28 percent of US men aged 45 to 64 years, and 10 percent of those aged 65 years and older, smoke. The corresponding numbers for elderly women are 23 percent and 11 percent, respectively (Centers for Disease Control and Prevention 2002).

[25]By comparison, prevalence of alcohol drinking in the US of those aged 55 years and older is 57 percent for men and 40 percent for women (Centers for Disease Control and Prevention 2002).

[26]These numbers refer to 1995 to 1998 only, as the RLMS did not collect information on physical activity in 1994.

to the deterioration in nutrition and health status as a result of wage arrears, as described in the next sections.

Food expenditure

The loss in income through wage arrears is likely to force households to reduce cash outlays, including food purchases. As shown in Table 7.12, households lowered food expenditures overall and switch towards cheaper sources of calories. The elderly women with wage arrears prepared food more often at home. The elderly men cut back expenses on eating out by one quarter, but the coefficient is significant only at the 15 percent level. Both the male and female elderly reduced food purchases by 13 percent. These are remarkable savings, amounting to about one quarter of the wage arrears shock. Furthermore, households substituted towards less expensive food, both across and within food categories. The share of bread in food purchases rose by between 4 to 5 percent, while those of sugar, meat and other food fall. Overall, the price of one calorie purchased dropped by about 10 percent for women. It fell by 5 percent for men, but is not significant at the 10 percent level.[27]

Nutrition

A detailed breakdown of the impact of wage arrears on nutritional status is shown in Table 7.13. This analysis draws on comprehensive food intake data based on 24-hour food recall, covering all meals irrespective of where they were consumed (home, work, friends, or school) and how they were obtained (purchase, home production, or donation). Caloric requirements are higher for the prime-age than the elderly, men than women, and the physically active than the physically idle. For old age men, caloric intake declined by 96 calories to 2157 calories, and for old age women by 87 calories to 1441 calories. These levels are far below the RDA for men (2500 calories) and women (1950 calories) according to the average body weight

[27]The calculation is based on determining the caloric content of 48 purchased food items, drawing on information in the food conversion table developed for the diary section.

Table 7.12: Wage arrears and food purchases

	Men				Women			
	Impact		Level		Impact		Level	
	Coef (1)	t-st (2)	Coef (3)	SE (4)	Coef (5)	t-st (6)	Coef (7)	SE (8)
Eating out (per capita)	-30	-1.5	82	20	-2	-0.1	87	20
Food prepared at home (%)	0.002	0.4	0.775	0.006	0.012	1.9	0.795	0.006
Price per purchased calorie	-0.05	-1.4	1.00	0.03	-0.10	-3.8	0.96	0.02
Food purchases (per capita)	-227	-3.3	1492	74	-204	-4.0	1314	49
Of which (%):								
Dairy	-0.006	-1.2	0.087	0.004	-0.001	-0.3	0.088	0.004
Meat	-0.007	-0.7	0.231	0.009	-0.023	-2.7	0.226	0.009
Fish	0.001	0.2	0.035	0.004	0.002	0.5	0.035	0.004
Potato	0.000	-0.1	0.020	0.004	-0.002	-0.9	0.015	0.003
Bread	0.040	3.2	0.290	0.011	0.052	5.1	0.298	0.011
Eggs	-0.002	-0.6	0.028	0.002	-0.001	-0.4	0.028	0.002
Fat	0.000	0.0	0.095	0.006	0.005	0.9	0.102	0.005
Fruits	0.000	0.1	0.042	0.004	-0.006	-2.1	0.039	0.003
Sugar	-0.017	-2.3	0.103	0.007	-0.015	-2.2	0.099	0.006
Vegetables	0.002	0.4	0.036	0.004	-0.005	-1.3	0.036	0.003
Other food	-0.011	-3.7	0.033	0.003	-0.006	-1.8	0.036	0.003
Observations (#)	1810				2815			

Notes: The elderly in arrears households are compared to the elderly in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. The sample is restricted to worker households. The coefficients in columns 1 and 5 are the impact estimates of wage arrears on the elderly in arrears households. The coefficients in columns 3 and 7 are the level estimates for the elderly in arrears households.

and age of this population.[28] The decline in energy intakes implies a reduction in a range of nutrients. Daily intakes of protein fell by 2.7 gram (g) to 45g for women, and 5.9g to 69g for men, relative to a RDA of 63g and 50g for this age group. In addition, the elderly suffered from multiple deficiencies in intakes of vitamins (vitamin A, thiamin (for women only), riboflavin, niacin, vitamin C) and minerals (calcium, magnesium and potassium), which were worsened by the dietary adjustments in response to wage arrears.[29] Finally, these deficiencies were unlikely to be compensated through food supplements. Only few elderly reported taking any during the last 7 days, and the arrears group had lower consumption levels than the non-arrears group.

Cognitive functions

The impact of wage arrears on cognitive functions is measured by memory and subtraction scores (Table 7.14). They change only slightly for men, and rise by 5 to 7 percent for women. However, the prevalence of dementia rises typically only from 65 years of age onwards (Schmand et al. 1997). If only this age group is retained, wage arrears had a negative impact on the cognition indicators.

Health outcomes

The middle section of Table 7.14 shows that the health status of the female elderly was worse than of the male elderly, with more functional limitations, higher chest pain incidence and lower self-

[28]On average, men weigh 74 kg and are 62 years of age. Women weigh 71 kg and are 66 years of age. The calorie allowances assume light physical activity and a mean environmental temperature of 20 degree of Celsius.

[29]The RDAs for men and women aged 51 years and older are as follows: vitamin A (men: 3330 IU; women: 2664 IU); thiamin (1.2 mg, 1.0 mg); riboflavin (1.4 mg, 1.2 mg); niacin (15 mg NE, 13 mg NE); vitamin C (60 mg, 60 mg); calcium (800 mg, 800 mg); iron (10 mg, 10 mg); magnesium (350 mg, 280 mg), and potassium (3500 mg, 3500 mg). The comparisons between estimated and recommended intakes have to be interpreted with caution (see footnotes in Section 8.2.2).

Table 7.13: Wage arrears and nutritional status

	Men				Women			
	Impact		Level		Impact		Level	
	Coef	t-st	Coef	SE	Coef	t-st	Coef	SE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Energy (kcal)	-96	-2.3	2157	39.4	-87	-3.9	1441	22.3
Calorie-providing nutrients								
Protein (g)	-5.9	-4.4	69	1.4	-2.7	-3.0	45	0.9
Fat (g)	-6.0	-3.0	77	1.9	-3.7	-3.4	48	1.0
Vitamins								
Vitamin A (IU)	-575	-2.6	1276	261	-247	-1.6	910	136
Thiamin (mg)	-0.05	-2.2	1.22	0.03	-0.03	-2.5	0.80	0.01
Riboflavin (mg)	-0.11	-3.1	1.14	0.04	-0.05	-2.4	0.78	0.02
Niacin (mg)	-0.6	-1.9	14.5	0.3	-0.3	-1.6	9.5	0.2
Vitamin C (mg)	-0.3	-0.1	58	2	-1.6	-1.2	45	1
Minerals (mg)								
Calcium	-47	-2.6	582	17	-21	-2.4	431	11
Iron	-1.0	-2.5	16.9	0.3	-1.0	-3.7	11.7	0.2
Magnesium	-11	-1.7	313	7	-8.0	-1.5	230	5
Potassium	-109	-2.1	1961	41	-170	-3.7	1730	40
Food supplements during last 7 days?								
Multivitamins	-0.02	-2.9	0.025	0.007	-0.02	-2.5	0.040	0.008
Separate vitamins	-0	-0.3	0.021	0.006	-0.01	-1.2	0.025	0.006
Minerals	-0.01	-1.6	0.006	0.003	-0	-0.7	0.010	0.004
Observations (#)	1810				2815			

Notes: The elderly in arrears households are compared to the elderly in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. The sample is restricted to worker households. The coefficients in columns 1 and 5 are the impact estimates of wage arrears on the elderly in arrears households. The coefficients in columns 3 and 7 are the level estimates for the elderly in arrears households.

Table 7.14: Wage arrears, cognitive functions and health outcomes

	Men				Women			
	Impact		Level		Impact		Level	
	Coef	t-st	Coef	SE	Coef	t-st	Coef	SE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cognitive functions								
Memory score	0.08	0.4	6.9	0.2	0.47	2.6	6.8	0.2
Subtraction score	0.04	0.3	3.3	0.1	0.15	1.8	3.0	0.1
Health outcomes								
ADL	0.018	2.2	0.239	0.009	0.010	1.2	0.411	0.010
Chest pain?	0.015	0.9	0.140	0.018	0.030	2.1	0.236	0.016
Self-rated health	0.07	2.6	3.1	0.02	0.02	0.7	3.4	0.02
Health outcomes (t+1)								
ADL	0.029	2.3	0.257	0.012	-0.004	-0.4	0.395	0.011
Deceased?	0.035	2.5	0.071	0.013	0.000	0.0	0.040	0.008
Observations (#)	1810				2815			

Notes: The elderly in arrears households are compared to the elderly in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. The sample is restricted to worker households. The coefficients in columns 1 and 5 are the impact estimates of wage arrears on the elderly in arrears households. The coefficients in columns 3 and 7 are the level estimates for the elderly in arrears households.

rated health.[30] Wage arrears resulted in an 8 percent increase in the ADL index for men, and a 2.5 percent rise for women, but only the rise for men is statistically significant. The effect on men is equivalent to the rise in ADL due to aging by 14 months. The incidence of chest pain rose for men and women by about 12 percent, but the coefficient is significant only for women. Finally, the deterioration in health was also reflected in a worsening of the self-rated health status, especially for men.

Mortality

Arguably the most severe consequence of a decline in health status is death. As argued by Sen (1998), long life is universally valued not just because of the intrinsic importance that we attach to living, but also as a necessary requirement for carrying out plans and projects that we value. Furthermore, associated characteristics of high life expectancy, such as low morbidity and high human capital, are equally desirable. Mortality statistics can serve as a proxy for achievements in these areas (Liao et al. 1999), which are typically difficult to measure.

With a few adjustments, the matching approach can be used to investigate whether wage arrears led to increased old age mortality. I retain only persons with information on survival status in the next round, and exclude one-person households, as I cannot distinguish death from other reasons for attrition. This reduces sample size from 4625 to 3009 elderly. Due to the sampling periods for the RLMS rounds, I obtain approximately one-year mortality rates for 1994 and 1995, and two-year mortality rates for 1996. By merging these rounds, I assume that the impact of wage arrears on mortality rates is not systematically different for a one-year than a two-year horizon.

In view of the relatively small number of reported deaths, it is interesting to ask whether RLMS mortality rates are similar to census-based statistics. Table 7.15 compares age-specific, one-year mortality rates in 1996, as reported by WHO, to those obtained from

[30]Women are on average 4 years older than men in the sample, but female health remains worse when I control for age differences.

the 1994 and 1995 RLMS rounds. Both series match fairly closely, even though the female mortality rates for the top two age groups are smaller than for the census data.[31]

Table 7.15: Comparison between WHO and RLMS age-specific mortality rates

	55-64 ys (1)	65-74 ys (2)	75+ ys (3)
1996 WHO			
Male	0.036	0.063	0.136
Female	0.013	0.031	0.114
1994 - 1996 RLMS			
Male	0.032	0.050	0.140
Female	0.017	0.018	0.075

Source: RLMS (1994 to 1996); WHO (2000).

The mortality rate between t and t+1 is determined not just by economic factors and current health behaviours, but also linked to the stock of health, which reflects the entire history of past health inputs and behaviours. The results are shown in the bottom part of Table 7.14. Wage arrears increased the probability that an elderly dies between two rounds from 3.6 to 7.1 percent for men, whereas there was no impact on women. The impact on men is about equivalent to the difference in mortality rates between smokers and non-smokers. Similarly, among the elderly who survived until the next round, the ADL index deteriorated for men from 0.23 to 0.26, but the functional limitations of women were unaffected.

[31]The comparison is only approximate, as the WHO series gives crude death rates (number of deaths in a population in a year by the total population) and the RLSM probabilities of death (number of deaths between two surveys relative to the starting size of the population).

7.4 Sensitivity Analysis

The results so far have demonstrated a consistent deterioration in economic and health status of male elderly. The impact on female elderly was limited to income, nutrition and chest pains. A number of issues require further exploration, including the heterogeneity of impacts across subsamples, the definition of wage arrears and DIDM estimation.

7.4.1 Subsamples

Non-working elderly

The total sample contains both working and non-working elderly. It is worthwhile to confirm the main results for the non-working subsample for two reasons. First, it ensures that there is no feedback from the health status of the elderly to the likelihood of being paid wages. Second, working elderly are on average 7.5 years younger than non-working elderly,[32] and age is itself a key determinant of health. Table 7.16 shows the impact estimates for the main economic, nutrition, cognitive and health variables for the non-working sample only. The male sample is reduced by about 60 percent, and the female sample by 30 percent. Without working elderly, the share of wage earners among all household members drops by 10 percent. The absolute size of the wage arrears shock is somewhat smaller, even though it is larger as percentage of wage income. Household income declined by more than wages, in particular for men, indicating a failure of arrears households to compensate for wage arrears through other income sources.

For women, the impacts on caloric and protein intakes, cognitive and ADL scores, chest pains in the last 12 months and self-rated health are similar compared to the joint sample of working and non-working elderly together. By contrast, the impact on the nutrition, cognitive functions and health of non-working elderly men are worse than for the full sample. Caloric intake dropped more than three times as much and protein intake by about twice as much. Mem-

[32]The correlation coefficient of years of age and non-working is 0.44.

Table 7.16: Wage arrears and economic and health status: non-working elderly only

	Men				Women			
	Impact		Level		Impact		Level	
	Coef	t-st	Coef	SE	Coef	t-st	Coef	SE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Economic status (per capita)								
Wages	-880	-12	355	65	-799	-27	336	27
Income	-1010	-10	1422	109	-846	-16	1375	50
Nutrition								
Caloric intake	-290	-4.7	1821	59	-86	-3.2	1395	27
Protein intake	-9.7	-4.8	58	2	-2.3	-2.3	43	1.0
Cognitive functions								
Memory score	-0.04	-2.0	0.29	0.02	0.01	1.2	0.30	0.01
Subtraction score	-0.40	-2.1	2.91	0.2	0.17	2.0	2.6	0.1
Health outcomes								
ADL	0.024	1.1	0.362	0.023	0.011	1.2	0.469	0.010
Chest pain?	0.026	0.7	0.216	0.037	0.028	1.5	0.267	0.021
Self-rated health	0.05	0.7	3.4	0.1	0.01	0.3	3.6	0.039
Health outcomes (t+1)								
ADL	0.057	2.0	0.393	0.026	-0.005	-0.4	0.447	0.016
Deceased?	0.041	1.2	0.103	0.030	0.00	-0.3	0.054	0.013
Observations (#)	710				1983			

Notes: The elderly in arrears households are compared to the elderly in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit

ory and subtraction scores deteriorated by between 10 to 20 percent. This effect is remarkable, as it is not in response to a personal economic shock, but to wage arrears of another household member. Functional limitations rose by 30 percent and chest pain incidence during the last 12 months by 70 percent. The detrimental impact on health persisted to the next round. The ADL score was about twice as large as for the full sample, and the absolute change in mortality was almost 20 percent greater.

The finding of larger impact estimates for the non-working elderly men relative to the entire sample of male elderly could have two possible explanations. It could suggest a greater vulnerability of health to income shocks at older age.[33] Alternatively, it may indicate that households do not share resources equally. For example, non-working elderly could suffer disproportionately from the wage arrears shock, perhaps to protect the health status and productivity of the working members of the households,[34] or due to a weak bargaining position.

Elderly without medical insurance

The results of Section 7.3.3 suggest that the deterioration in health status of arrears elderly was not linked to worse access to health services, the elderly without medical insurance present a particularly vulnerable group. Compared to those with medical insurance, they live in households with 10 percent more members, have about 10 percent less assets, are about 2 years older, and have between one to two years less education. These factors indicate that these elderly may be disadvantaged in dealing with an income shock. This is borne out in Table 7.17, which shows impact estimates, based on matching arrears elderly without medical insurance to non-arrears elderly without medical insurance. For men, the reduction in wages and income is lower than for the full male sample. Nevertheless, the impact on nutrition, cognitive functions and health is consistently

[33]The average age of elderly men in arrears households increases from 61.8 years to 66.2 years when working male are dropped.

[34]The models of Ray (1998) and Miguel (2003) highlight the desirability of unequal resource distribution in case of need in order to sustain a minimum level of productivity of at least some household members.

larger, with the exception of next round's ADL score. As before, women displayed a lower sensitivity to the income shock than men. The drop in wages and income was somewhat larger than for the entire female sample, as was the impact on nutrition and health, while the changes of cognitive functions were insignificant. Furthermore, there was no evidence for worse female health in the next survey round.

Table 7.17: Wage arrears and economic and health status: elderly without medical insurance and obese female elderly

	Elderly without medical insurance								Obese women			
	Men				Women							
	Impact		Level		Impact		Level		Impact		Level	
	Coef (1)	t-st (2)	Coef (3)	SE (4)	Coef (5)	t-st (6)	Coef (7)	SE (8)	Coef (9)	t-st (10)	Coef (11)	SE (12)
Economic status (per capita)												
Wage	-830.7	-11	589.3	88	-947.2	-22	385.1	42	-756	-12	447	56
Income	-816.9	-6	1932	131	-1145	-12	1596	91	-692	-6	1742	129
Nutrition												
Caloric intake	-234.8	-3.9	2039	71	-114	-2.8	1410	40	-74	-1.9	1496	35
Protein intake	-8.7	-3.9	66	3	-2.6	-1.8	44	1.4	-1.7	-1.2	47	1.54
Cognitive functions												
Memory score	-0.04	-2.5	0.31	0.02	0.01	0.9	0.29	0.01	0.023	1.6	0.36	0.013
Subtraction score	-0.03	-0.2	3.0	0.2	0.03	0.2	2.6	0.2	0.1	0.8	3.2	0.1
Chest pain?	0.041	1.6	0.145	0.026	0.025	1.2	0.232	0.024	0.045	1.5	0.286	0.028
Subjective health	0.169	3.1	3.178	0.055	0.040	1.0	3.524	0.039	0.053	1.3	3.43	0.043
Health outcome (t+1)												
ADL (t+1)	0.011	0.5	0.278	0.023	0.000	0.0	0.419	0.016	0.005	0.3	0.418	0.018
Mortality rate (t+1)	0.043	2.0	0.080	0.023	-0.003	-0.3	0.040	0.013	0.018	1.4	0.030	0.013
Observations (#)	736				1259				1381			

Notes: The elderly in arrears households are compared to the elderly in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. In columns 1 to 8, the sample is restricted to the elderly without medical insurance in worker households; and in column 9 to 12, to the obese elderly in worker households. The coefficients in columns 1, 5 and 9 are the impact estimates of wage arrears on the elderly in arrears households. The coefficients in columns 3, 7 and 11 are the level estimates for the elderly in arrears households.

Obese old age women

Obesity is extremely common among Russian old age women. Two in five female aged 55 years or older are obese.[35] Obesity aggravates

[35]By comparison, the prevalence of obesity among US women aged 55 years and older is 27 percent (Centers for Disease Control and Prevention 2002).

cardiovascular disease and osteoarthritis and increases the liability to hypertension and certain types of cancer (Burton and Foster 1988).

Obesity is not correlated with low socioeconomic status. Obese women have similar household income, assets and education, and are about 2.5 younger than non-obese women. Column 9 to Column 12 in Table 7.17 show impact estimates of wage arrears for the group of obese women living in households with wage arrears, when matched to obese women in non-arrears households. Obese women experienced a lower resource shock than the full female sample, with impacts on wages and income about 15 to 25 percent lower. While the impact on nutritional status was slightly lower than before, the cognitive indicators no longer improved. More importantly, the negative impacts on health outcomes were larger, and statistically significant for ADL score, and marginally significant for chest pains in the last 12 months and self-rated health. Wage arrears also led to higher mortality among obese females in arrears households by the next survey round.[36] These findings document a specific vulnerability of obese female elderly to wage arrears.

7.4.2 Definition of Wage Arrears

The concept of wage arrears employed in the analysis combines two dimensions: being owed wages, and not having received any wages during the last 30 days. Any household with at least one worker who is owed wages and did not receive any wage payment during the last 30 days is classified as arrears household. Other families with at least one worker are non-arrears households. Table 7.18 displays impact and level statistics on dimensions of wage arrears. The arrears elderly lived in household whose wage arrears were 40 percent higher in terms of the outstanding monthly wage payments per capita, 70 percent higher in terms of the number of workers with wage arrears in the household, and more than double the amount of wage arrears in Ruble per capita. For example, while arrears households were owed on average R2800 per capita, the matched non-arrears group was

[36]The detrimental effect of obesity on longevity is an important reason why obesity is rarely found among the very old (Burton and Foster 1988).

owed about R1400 per capita.[37] While only one in four workers in arrears households received wage payments during the last 30 days, about 19 in 20 workers did so in non-arrears households. Thus, the main concern with regard to the wage arrears definition is that the non-arrears group contains many elderly living in households with outstanding wage claims. Including these persons may result in lower impact estimates as it blurs the distinction between arrears and non-arrears groups.

Table 7.18: Definition of wage arrears: wages owed and wage payments in last 30 days

	Impact		Level	
	Coef	t-stats	Coef	SE
	(1)		(2)	
Past wage arrears				
Month per capita	0.45	6.6	1.5	0.06
Ruble per capita	1482	12	2899	118
# per worker	0.34	19	0.83	0.01
No wage payment last 30 days				
# per worker	0.75	120	0.80	0.01
Observations (#)	4625			

Notes: The elderly in arrears households are compared to the elderly in non-arrears households according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. The sample is restricted to worker households. The coefficients in Column 1 are the impact estimates of wage arrears on the elderly in arrears households. The coefficients in Column 3 are the level estimates for the elderly in arrears households.

Table 7.19 presents the impact estimates when the arrears elderly are matched only to the elderly from households without any outstanding back-wages. The number of control elderly declines from 3300 to 1940, while the number of treatment elderly stays the same.[38]

[37] On a non per-capita basis, these amounts are equal to 5.1 monthly wages

The size of the wage arrears shock was about 20 percent larger than for the whole sample. As before, households could not successfully compensate the wage shortfall through other means, and household income contracted by slightly more than wages. The impacts on nutrition, cognitive functions, chest pains and self-rated health were worse for men than women, while other indicators were similar. The effects on women's health were comparable to those measured before, with the exception of higher effects on chest pains and self-rated health. These results imply that using the full control group leads to lower, or similar, impact estimates compared to a control group that contains only elderly from households without outstanding wage claims.

7.4.3 Difference-In-Differences Matching

The matching techniques used so far have not exploited the panel dimension of the data set. Difference-In-Differences Matching (DIDM) is a modified version of cross-sectional matching drawing on the sample of elderly with observations in two consecutive rounds. Arrears elderly live in households with no wage arrears in the initial (pre-arrears or pre-intervention) period and wage arrears in the subsequent (post-arrears or post-intervention) period. The control group contains the elderly without wage arrears in either pre- or post-arrears period. As with simple matching, treated observations are matched to non-treated observations using propensity scores. To ensure that the matching is not affected by the assignment to arrears status, the propensity scores are based on the characteristics of the pre-intervention period only. Separate regressions are run for the pairs of elderly from 1994 to 1995, and those from 1995 to 1996 and 1996 to 1998.

Since the data requirements are more stringent than in cross-sectional matching, there is a loss of sample size. In addition, DIDM estimation relies on a comparison of the change from pre- to post-intervention period of the treatment group relative to the control group, which implies that only one impact estimate is derived for

ple as the matching procedure results in a slight variation in the number of matched treatment elderly.

Table 7.19: Wage arrears and economic and health status: control group without outstanding wage claims

	Men				Women			
	Impact		Level		Impact		Level	
	Coef	t-st	Coef	SE	Coef	t-st	Coef	SE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Economic status (per capita)								
Wage	-1152	-24	574	41	-1100	-25	438	36
Income	-1220	-15	1814	74	-1154	-16	1651	56
Nutrition								
Caloric intake	-108	-2.4	2148	42	-78	-3.0	1447	24
Protein	-5.6	-3.6	69	1	-3.0	-3.6	44	1
Cognitive functions								
Memory score	-0.01	-1.0	0.34	0.01	0.01	1.8	0.34	0.01
Subtraction score	-0.29	-2.5	3.3	0.1	-0.01	-0.2	3.0	0.1
Health outcomes								
ADL	0.017	1.7	0.237	0.010	0.006	0.8	0.409	0.008
Chest pain?	0.029	2.1	0.139	0.015	0.049	2.9	0.244	0.015
Self-rated health	0.14	5.0	3.1	0.0	0.05	1.9	3.4	0.0
Health outcomes (t+1)								
ADL	0.031	2.2	0.254	0.013	-0.011	-1.1	0.407	0.011
Mortality	0.028	2.0	0.069	0.015	0.003	0.3	0.043	0.009
Observations (#)	1218				1909			

Notes: The elderly in arrears households are compared to the elderly in non-arrears households iwithout past wage claims according to spline-smoothing matching, based on the propensity scores derived from the logit regressions of Table 7.2. The sample is restricted to worker households. The coefficients in columns 1 and 5 are the impact estimates of wage arrears on the elderly in arrears households. The coefficients in column 3 and 7 are the level estimates for the elderly in arrears households.

each pair of observations. The sample contains 1662 pairs of elderly with relevant information on pre- and post-arrears periods. Of these, 1022 are women, of whom 221 are in the treatment group (no arrears in the pre-intervention period and arrears in post-intervention period), compared to 640 men, of whom 154 belong to the treatment group. Furthermore, 8 of the treated women, and 9 of the treated men, cannot be matched. Overall, compared to cross-sectional matching, the DIDM sample size drops from 4625 to 1662 for the entire sample, from 1295 to 375 for the treatment sample, and from 1232 to 358 for the matched treatment sample. Compared to cross-sectional matching, DIDM is based on only 30 percent of the number of impact estimates.

Table 7.20 present impact estimates based on DIDM estimation, in line with Equation 2.18. The identifying assumption is that the matched control group evolve from the pre- to post-arrears period in the same way as the treatment group would have done in the absence of arrears. For male elderly, wages contracted by around 20 percent more than for cross-sectional matching, while income dropped by about the same. The reduction in caloric intake was larger, but statistically insignificant, and contemporaneous and future health outcomes were worse. For female elderly, wages dropped by about the same as before, whereas income fells by about 15 percent less. Nevertheless, the nutritional and health impacts were slightly larger, with the exception of chest pains incidence during the last 12 months, which were unchanged. As before, the next round's ADL scores and mortality are not significantly different from zero, and the coefficient on mortality is negative.[39] Overall, compared to the estimates from cross-sectional matching, the impact estimates are remarkably similar, and even larger for some indicators, although they are less statistically significant due to lower sample size.

[39]Since the RLMS provides no information on cognitive functions in 1994, the sample size for the cognitive indicators is reduced to 159 matched arrears women, and 97 matched arrears men. The estimated impacts are all insignificant. However, if I consider the subsample of non-working elderly, which reduces the number of the matched treated by 50 percent, the memory score deteriorates significantly for men (0.085 with t-statistics of 2.2) but not for women (-0.029 with t-statistics of 1.3), while the changes in the subtraction score are insignificant.

Table 7.20: Wage arrears and economic and health status: Difference-In-Differences matching

	Men		Women	
	Coef	t-st	Coef	t-st
	(1)	(2)	(3)	(4)
Economic status (per capita)				
Wage	-1157	-4.3	-796	-4.4
Income	-1160	-5.5	-878	-5.8
Nutrition				
Caloric intake	-128	-1.0	-135	-2.7
Protein	-4.9	-1.2	-2.9	-1.2
Health outcomes				
ADL	0.030	2.1	0.018	1.5
Chest pain	0.054	1.0	-0.012	-0.3
Self-rated health	0.097	1.9	0.088	1.8
Health outcomes (t+1)				
ADL	0.036	2.6	0.008	0.6
Mortality	0.054	2.0	-0.019	-1.2
Observations (# pairs)	640		1022	

Notes: The elderly in arrears households are compared to the elderly in non-arrears households according to spline-smoothing difference-in-differences matching. The propensity scores are based on the characteristics at t-1, derived from the specification of the logit regressions of Table 7.2. The sample is restricted to worker households. The coefficients are the impact estimates of wage arrears on the elderly in arrears households.

7.5 Conclusion

The chapter has investigated the relationship between economic and health status at old age using the example of the wage arrears crisis in Russia during the mid-1990s. The analysis has illustrated that economic factors can be forceful determinants of welfare and health even at old age. Households with wage arrears saw salaries dropping by almost two thirds, income falling by more than one third, and poverty doubling. Behavioural responses to compensate for the income drop through higher labour supply, durable sales, or borrowing were mostly ineffective due to tight labour markets, low asset holdings, and declining intra-household transfers. The net revenue loss amounted to just over five sixth of the wage shocks for men, and nine tenth of the wage decline for women.

Elderly cut back on food expenses by reducing food purchases and eating out and adjusting the diet towards cheaper calories, economising expenditures equal to about one quarter of the wage reduction. As a result, caloric and protein intakes dropped, although substantially less than household income, and the nutritional content of the food consumption with regard to vitamins and minerals worsened. Old age health indicators also declined, including functional limitations and mortality between survey rounds.

Wage arrears had a larger impact on male health than on female health, even though the income shock was comparable. Protein intake dropped by 8 percent for men and 6 percent for women, and ADL scores rose by 8 percent for men and 3 percent for women. In addition, the negative health impact of wage arrears persisted over time for elderly men, but not for elderly women. Old age men living in arrears households were almost twice as likely to die, and functional limitations of surviving male elderly rose by over 10 percent. By contrast, there was no impact on mortality and next round's ADL scores among old age women. Remarkably, the changes in self-rated health are consistent with gender differences of objective indicators. Self-rated health worsened by 2.5 percent for men, and only by 0.5 percent for women. The worse impact of wage arrears on male rather than female health status is consistent with the evidence on changes in the health of the Russian population during the 1990s.

One possible explanation for the differential gender impact is health behaviour. Men's past and present drinking and smoking habits are systematically more unhealthy.

There is little evidence that alternative explanations can account for the findings, including access to health service, environmental conditions, drinking, smoking, and physical exercise, other economic factors, and feedback from health to income. While the point estimates vary, wage arrears worsen health outcomes over various estimation techniques and sample restrictions. The detrimental impact of wage arrears is similar or even larger for elderly without medical insurance, obese women, or when the control group contains only those elderly who live in households with no outstanding wage claims. For these subgroups, there is also a negative impact on male but not female cognitive scores. They fell by 12 percent for men and rose by 4 to 7 percent for women. Among vulnerable groups (elderly without medical insurance, obese women), health outcomes of elderly women deteriorate more consistently than for the full female sample, even though the impact remains less than for elderly men.

Chapter 8

Children and Wage Arrears

8.1 Introduction

Improving child health is one of the eight goals of the Millennium Declaration adopted unanimously in September 2000 by the members states of the United Nations. Child health has a central role for individual well-being, as the first few years of life are essential for the later physical, mental and emotional development of a person. Temporary shortfalls in health or nutrition can have lasting and irreversible effects when occurring during childhood. Differential health investments may even lead to poverty and disadvantage transmitted across generations, as children of poor parents receive worse health investments, which in turn may reduce future earnings capacity.

While it has long been known that great health disparities exist between rich and poor countries (Grossman 1972), the focus has shifted more recently to establishing the within-country correlation between socioeconomic status (SES) and child health. In nearly every country for which data are available, children residing in households with low income, asset, or education have worse health than those children who are better-off (Gwatkin 2002, Wagstaf 2000, Menon et al. 2000, and Pradhan et al. 2003). Poor child health can result from unhealthy environments, insufficient or unaffordable health care, unhealthy behaviours, or lack of food (Allen and Gillespie 2001, World Health Organization 1999, and Lavy et al. 1996). But what is the role of household income? Does a negative income

shock lower child health? Can access to free health care and affordable nutrition limit the impact of less income? Since alternative channels suggest different policy responses, understanding the importance of household resources for child health is obviously important.

A number of papers have investigated how changes in economic conditions affect health status, but much of the research fails to identify an exogenous source for the variation in income (Strauss and Thomas 1995). Most studies use reduced-form estimations, with only exogenous variables on the right-hand side and provide an estimate on the net impact of the exogenous factors. However, in a dynamic setting, income, consumption, or assets are endogenously determined, and well-off households typically adopt more healthy behaviours, and live in areas with a cleaner environment, safer water and better health care. This raises the possibility that the estimated effects of household resources on child health are likely to be biased by the omission of unobserved household or community features.[1]

Only few papers have explicitly looked at the impact of income shocks on child health. Foster (1995) develops a model of weight changes in Bangladeshi children as a result of a weather shock. He finds that weight growth for children in landless households was reduced in the aftermath of flooding by credit market imperfections. Similarly, Hoddinott and Kinsey (2001) show that drought can lead to lower child growth. Duflo (2000) analyses the impact of the South African pension program to elderly Africans. She argues that pensions received by women led to a large improvement in the anthropometric status of girls, and an insignificant amelioration of boys' health, but found no effect of the pensions paid out to men.

This chapter follows Duflo (2000) in investigating the impact of an exogenous variation to household income on child health. As in Chapter 7, wage arrears are the source of the negative income shock. During the wage arrears crisis in Russia in the mid-1990s, between one third to three fifths of families with young children

[1]For example, Thomas et al. (1990) conclude that controlling for observed community characteristics, the estimated effect of household per capita income on child health becomes insignificant.

suffered from non-payment of wages.[2] Applying matching estimation to a nationally representative survey, the study investigates a wide range of economic and health measures for children.[3] The analysis shows that the welfare of children deteriorates as a result of wage arrears.

The reasons for using matching estimation as evaluation method are analogous to Chapter 7. To reiterate briefly, matching has important advantages over regression estimation, as it does not rely on a specific functional form, ensures a careful matching of each arrears child with comparable non-arrears children and eliminates any arrears children whose observable characteristics fail to match those of non-arrears children. Under the assumption of no selection on unobservables, matching identifies the impact of wage arrears on children with wage arrears. By drawing on firm and regional characteristics, the matching procedure ensures that arrears and non-arrears children are placed in a common economic and geographic environment. Since the anthropometric indicators of children vary by age, I employ Mahalanobis-matching to obtain a close matching of children by age. Similar to Chapter 7, I will also present impact estimates based on difference-in-differences matching. The principal advantage of this approach is that it allows for selection into arrears status based on unobservable fixed effects. However, since the wage arrears crisis affected a significant proportion of the labour force throughout the time period under consideration, difference-in-differences matching relies on only half the number of impact estimates compared to cross-sectional matching.

Since the incidence of wage arrears is not affected by the health status of children in working families, there is no concern about contamination of the estimates through a feedback from health to

[2]Child welfare developments in Russia during the 1990s are analysed in World Bank (2002a).

[3]At least two other papers have recently used matching techniques to look at determinants of child health. Jalan and Ravallion (2003) apply propensity score matching to cross-sectional data to establish that the prevalence and duration of diarrhea among children under five in rural India are signficantly lower for families with piped water than for other families. Galiani et al. (2002) use difference-in-differences matching of municipalities in Argentina and estmate that child mortality dropped in areas that privatized water services.

economic status. However, worse child health and high wage arrears could both be triggered by a third factor. For example, structurally weak regions, sectors and enterprises could have been affected more by the non-payment crisis of wages and at the same time have worse child health outcomes. I exploit a rich data set to rule out that issues like pension arrears, access and quality of health services, variation in regional living standards, and environmental conditions account for differences in child welfare.

The rest of the chapter is organized as follows. The next section introduces the data set, lays out the estimation strategy, explains the choice of the sample, and explores key identification issues. Section 8.3 presents impact estimates of wage arrears on children living in arrears households. It discusses the effects on economic well-being, including coping mechanisms and health status, covering access to health service, health behaviour, nutrition and anthropometrics. Section 8.4 scrutinizes the main findings with regard to subsamples, wage arrears definitions and estimation techniques. The final section concludes.

8.2 Methodology

8.2.1 Sample

Children living in households with workers constitute the focus of the analysis. The 1994 to 1998 rounds of the RLMS provide 2797 observations on children under the age of 7 years, of which 2532 have information on anthropometric status. The same definition of wage arrears as in Chapter 7 is used. A household is a wage arrears household if at least one of its members has wage claims outstanding and has received no wage payments during the last 30 days. Applying this concept, there are 820 children who live in households with wage arrears (the treatment or arrears group), and 1977 children who reside in households without wage arrears (the control, comparison or non-arrears group).

To account for gender differences in child welfare, I will present separate statistics for the 408 arrears boys and 412 arrears girls. Since Russian families are small, the bulk of the boys and girls come

from different families. Only one in four families have more than one child under the age of 7, and only 15 percent of the sample come from families with children from both sexes under the age of 7 years.

The analysis focuses on the health status of children less than 7 years of age for three reasons. First, in view of the changing pathways between economic and health status over the lifetime (Smith and Kington 1997), it is useful to focus on one particular age group. Second, as argued in the introduction, health outcomes in the first years of life are especially important, as they affect a person's health status throughout the entire life cycle. Finally, as discussed in the next section, the RLMS provides reliable measures of child health.

8.2.2 Child Health

The analysis characterizes child health in terms of inputs and outputs. Health inputs include food consumption, as measured by food expenditures, intakes of calories, protein, fat, vitamins and minerals, breast-feeding and food supplements; the use of medical services and medicine; health behaviour; and (as input into growth status) sickness. Health outputs comprise height-for-age (HFA), weight-for-height (WFA), and the derived indicators of stunting and wasting.

Anthropometric Status

Health outcomes are based on anthropometric measures. Growth assessment is considered as the best single measurement to define the health and nutritional status of children (World Health Organization 1995). Accumulated episodes of disturbances in health and nutrition, regardless of whether they are the result of unsatisfactory food intake or disease, invariably affect child growth. These conditions, in turn, are closely linked to the general standard of living and whether a population is able to meet its basic needs such as food, housing and health care. Growth retardation in childhood has been associated with increased mortality, low cognitive ability, poor motor development and other impairments in function (World Health

Organization 1999 and Allen and Gillespie 2001).[4] Growth assessment thus serves as a means for evaluating the health and nutritional status of children, just as it also provides an indirect measurement of the quality of life of an entire population.

The perhaps most common anthropometric measures of child growth status are height-for-age (HFA) and weight-for-height (WFH) (Alderman 2000). They are typically expressed as z-scores derived with reference to a standard growth curve, as adopted by the World Health Organization (WHO),[5] that establishes the potential upper mean limit, and serves a benchmark to measure the impact of nutritional, economic, or any other environmental factors that prevent the child to reach full growth potential. HFA is obtained by subtracting each child's height from the median reference standard and then dividing this difference by the standard deviation of the reference distribution for a given age and gender. Stunting is defined as the incidence of 'small' children whose HFA is less than –2, and wasting as the incidence of 'low-weight' children whose WFH is less than -2. Stunting is a summary measure of longer-term cumulative nutritional status, or chronic malnutrition. Wasting reflects the result of recent undernourishment that has caused tissue loss but has not yet affected stature, and is viewed as indicator of acute malnutrition. In the empirical findings, I will present both the average z-scores for the population under consideration, and the percentage below the cutoff level of standard deviations. However, the discussion will concentrate on the changes in the shares of stunting and wasting as they capture growth shortfalls that endanger child health.

In Russia, 12.5 percent of children less than 2 years of age are stunted, compared to 10.5 percent of those less than 4 years of age, and 8.7 percent of those less than 7 years of age. By contrast, wasting rates show less age-dependency once children have grown out of infancy. Wasting prevalence declines from 3.6 for children less than 12 months of age to between 2.4 to 3.1 percent for children between

[4]For example, Pelletier and Frongillo (2002) use cross-country data to demonstrate that improvements in general malnutrition have a stiatistically significant effect on changes in child mortality.

[5]The data is compiled by WHO and the National Center for Health Statistics (USA) (www.who.int/nutgrowthdb/reference.html).

less than 2 to 7 years of age.

Evidence from developing countries suggests that the percent of stunted children increases over the first two years of age or so, before it declines slowly. This does not imply that the nutrient intake and status of children are worse at 2 years of age than earlier but reflects the cumulative nature of stunting. When children reach the age of 2 to 3 years, the nutrient requirements relative to body weight fall, and they become less vulnerable to stunting. The growth rate of stunted children then becomes fairly normal. There may also be some growth catch-up of stunted children even in adolescence when adopted in environments where they are well-fed and healthy, even though this does not usually compensate fully for failure to grow in early childhood (Allen and Gillespie 2001, World Health Organization 1999, and Behrman, Deolalikar, and Lavy 1995).[6] I will therefore study the impact of wage arrears on HFA and stunting for children no more than 3 years of age only. In view of the reduced sample size, I will group boys and girls together.[7]

While stunting and wasting are related concepts, stunting is likely to be more useful for a number of reasons. First, young children grow fast and nutritional deficiencies can be quickly reflected in growth faltering (World Health Organization 1999). Also, as discussed in Section 7.2.1, wage arrears are typically persistent, implying lasting income reductions that may affect the longer-term health status of children. Second, in line with the experience in developing countries, wasting has a low prevalence in Russia, while stunting is more widespread.[8] Furthermore, Russian children, on average, weigh more and are shorter than the reference population. WFH scores for boys (girls) less than 7 years of age are on average 0.45 (0.41) standard

[6]Hoddinott and Kinsey (2001) examine the impact of a drought on growth in height among children in Zimbabwe. They find that children aged 12 to 24 months experience growth failure in the aftermath of a drought, but establish little impact on children aged 25 to 60 months.

[7]Compared to the group of children aged less than 7 years, total sample size reduces from 2797 to 1052, and the number of arrears children from 820 to 298.

[8]The global prevalence of child stunting among those less than 5 years of age is about 33 percent, and the one of child wasting is about 9 percent (Allen and Gillespie 2001). The levels in Russia are comparable to middle-income countries in South America.

deviations above the reference population, whereas the HFA scores are 0.23 (0.13) standard deviations below the reference population. Third, while larger height is unambiguously better for children, more weight is not necessarily a sign of good health. Adult obesity, as one of the foremost health problems in industrialized countries, is linked to being overweight at young age. For example, almost one in six Russian men and two in five Russian women aged 40 years or older are obese. Fourth, attempts to model weight rather than height with the standard set of individual, household and community determinants have proven to be less successful (Pradhan et al. 2003). Fifth, the relationship between height and weight measures is still not well understood. The literature has found no apparent correlation between stunting and wasting prevalence, even though, conceptually, stunting should reflect the sum over short-term health status, as captured by wasting (Victora 1992 and Alderman 2000).[9]

The anthropometric indicators of child health have various advantages compared to other measures used in the literature (Micklewright and Ismail 2001). They do not suffer from problems of self-reporting like subjective health indicators, and measurement errors are unlikely to be related with SES. In addition, they concern a specific member of the household, side-stepping issues related to assigning an individual welfare level from a variables measured for the household as a whole. Anthropometric data can be collected in relatively short time, while the construction of consumption or income aggregates is complex, and involves the imputation of values for home production, the calculation of rental values of housing and durables, dealing with different recall periods, and converting nominal into real values.

Other Health Measures

To complement child growth measures, I will present statistics on the incidence of sicknesses during the 7 days preceding the survey

[9]One possible explanation is that children suffering from stunting are 'small' in height and therefore may not have low WFH, even though they may be underweight and suffer from acute malnutrition. In the RLMS data, none of the children are recorded as suffering simultaneously from both stunting and wasting.

(coughs, diarrhoea, congestion, sore throat, teething and earache). These indicators will allow me to assess whether any differences in anthropometric status could be the result of diseases, which typically have a direct bearing on the nutritional status of children. As one aspect of health behaviour, I report the weekly hours spent by children of preschool age in physical activity.

Finally, the chapter will also analyse the role of food and nutrition. As children are fully dependent on others for nutrient intake, the main causes of malnutrition are receiving diets of poor quality and inadequate quantity, and inappropriate feeding practices and behaviours (World Health Organization 1999). A well-balanced diet is much more than adequate energy intake, as protein, vitamins and minerals are essential for ensuring a healthy growth and development of children (Bhargava 2001 and Pollitt et al. 1993). I will investigate the impact of wage arrears on purchases of food items and intakes of food supplements during the last 7 days, breast-feeding of children up to 2 years of age, and the daily intake of a variety of micro- and macro-nutrients.[10] The RLMS recorded in 24-hour recall open-ended dietary data of up to 35 food items consumed by each person, giving rise to overall 1782 entries. Using a conversion table developed especially by nutritional researchers at the University of North Carolina, a detailed picture of the composition of the nutritional balance and deficiency emerges.

However, a word of caution is in place. Dietary intakes vary greatly from one day to the next, so it is impossible to derive on the basis of 24-hour food recall data nutritional deficiencies for a particular individual with certainty (Buzzard 1998). Furthermore, while much progress has been made in nutritional science over the last decades, the understanding of biologic mechanisms remains still too incomplete to predict confidently the ultimate consequences of eating a particular food or nutrient (Willett 1998).[11]

[10]The primary advantage of representing diets as specific compounds is that such information can be directly related to the fundamental knowledge of biology. However, an analysis based on foods, as opposed to nutrients, is generally most directly related to dietary recommendations because individuals ultimately manipulate nutrient intake largely by their choice of foods (Willett and Buzzard 1998). See also the following footnote.

[11]The most serious limitation to research in nutritional epidemiology has been

8.2.3 Estimation

The basic idea of the identification strategy is to compare child health in households with wage arrears to suitable control or comparison groups of worker households without wage arrears. The estimation follows the same approach as in Chapter 7. The first step is to calculate the likelihood of households incurring wage arrears based on logit regressions. With more than nine in ten households having either one or two workers, the characteristics of up to two worker per household are added separately. I also add a wide range of characteristics including possible proxies for otherwise omitted variables. They include the gender of the child, household size, economic determinants (housing characteristics, assets and land and livestock ownership) and regional factors (gross regional product, state budgetary expenditures and state tax revenues and arrears and settlement type). The model is run separately for each round to ensure that arrears households are matched to non-arrears households from the same year. The results are shown in Table 8.1.

The estimated PSM scores are then used to construct the matched samples. Gaussian kernel matching is used as the main weighting scheme. It draws on all controls to construct a weighted matched outcome for each treated unit, and the weights are distributed according to the normal distribution. In order to obtain close matching between treatment and control children in terms of age, I employ the Mahalanobis-metric matching, which looks for the closest match in terms of the Mahalanobis distance constructed from the propensity score and the month of age (Rubin 1980). Section 8.4 will compare these results to those of alternative matching techniques.

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the lack of practical methods to measure diet. Food intake data based on short term recall may not reflect the actual levels of various nutrients available in the body for various reasons, including measurement error, the use of mineral or vitamin supplements, the ability to absorb nutrients, and alternative sources for some nutrients, like exposure to sunlight. Furthermore, intakes of specific nutrients tend to be intercorrelated so that associations with one nutrient may be confounded by other aspects of the diet. Also, the intake of one nutrient may modify the absorption (like polyphenols contained in black tea which act as inhibitor in the case of iron), metabolism, or requirement for another nutrient, thus creating a biologic interaction. Finally, if taken in large doses, some nutrients, like vitamin A and vitamin C, can become harmful.

Table 8.1: Household logit regressions of wage arrears incidence

		1994		1995		1996		1998	
		Coef	z	Coef	z	Coef	z	Coef	z
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Male?		0.023	0.1	0.178	0.9	-0.176	-1.0	-0.124	-0.6
Demographics:	Household size (#)	0.087	0.8	-0.285	-2.5	-0.022	-0.2	0.065	0.6
	Members aged 0-15 (#)	-0.153	-1.0	0.451	3.1	0.023	0.2	-0.022	-0.1
Housing:	Living space (sq meter)	0.001	0.2	-0.004	-0.6	-0.001	-0.1	-0.015	-1.8
	Central heating?	0.165	0.4	0.352	0.9	0.555	1.6	0.363	0.8
	Central water supply?	-0.106	-0.3	0.089	0.3	-0.344	-1.1	-0.149	-0.4
	Hot water supply?	0.086	0.3	0.147	0.5	0.052	0.2	-0.006	0.0
	Metered gas or electric stove?	-0.480	-1.6	0.289	0.9	-0.061	-0.3	0.081	0.3
	Central sewerage?	0.307	0.8	-0.724	-1.8	-0.391	-1.0	-0.367	-0.8
Asset index		-0.215	-2.2	-0.095	-1.0	-0.086	-1.0	0.110	1.1
Agriculture:	Land use?	0.195	0.7	0.319	1.2	-0.456	-1.9	0.018	0.1
	Amount of land (sotkas)	0.000	1.3	-0.002	-1.9	0.001	0.6	0.009	0.8
	Livestock?	0.338	1.0	0.398	1.2	0.436	1.4	-0.730	-2.1
First worker:	Male?	0.415	1.5	-0.058	-0.2	-0.028	-0.1	-0.099	-0.4
	Age (months)	0.001	0.7	0.003	2.4	0.000	0.5	0.004	3.6
	Education (years)	-0.015	-0.3	-0.029	-0.7	-0.043	-1.1	-0.020	-0.4
	Tenure (months)	-0.003	-2.3	-0.001	-0.4	0.000	0.4	0.000	-0.3
	Occupational code	0.0000	-0.4	0.0001	1.3	0.0000	0.0	0.0001	1.6
	Emloyee's ownership (%)	0.087	0.6	-0.258	-1.4	-0.030	-0.2	-0.177	-0.9
	Enterprise ownership (Fully public as omitted category):								
	Some public?	0.614	2.3	0.176	0.7	1.154	3.6	0.689	2.4
	Fully private?	0.457	1.4	0.551	1.5	0.444	1.3	0.930	2.6
Second worker:	Another worker?	-2.668	-2.4	-2.933	-2.5	0.456	0.4	-1.473	-1.2
	Male?	0.474	1.4	-0.228	-0.7	-0.564	-1.7	-0.030	-0.1
	Age (months)	0.000	-0.2	0.002	1.3	0.001	0.6	0.004	2.6
	Education (years)	-0.140	-2.4	-0.114	-1.9	0.076	1.3	-0.142	-2.0
	Tenure (months)	0.001	0.3	-0.002	-1.4	0.003	1.8	-0.002	-1.2
	Occupational code	0.0000	0.0	-0.0001	-0.8	0.0000	-0.1	0.0000	-0.6
	Emloyee's ownership (%)	-0.029	-0.2	0.130	0.6	0.150	0.6	-0.128	-0.6
	Enterprise ownership (Fully public as omitted category):								
	Some public?	-0.130	-0.4	-0.225	-0.7	0.442	1.2	-0.371	-1.0
	Fully private?	-0.257	-0.6	-0.349	-0.9	0.923	2.2	-0.147	-0.3
State-level:	Government expenditure	0.0001	3.0	0.0001	2.4	0.0000	-0.2	0.0001	3.2
(Ruble per capita)	Regional tax revenues	-0.0001	-1.5	-0.0002	-1.4	-0.0001	-0.6	0.0000	0.1
	Regional tax arrears	0.0003	0.6	-0.0008	-1.0	-0.0002	-0.5	0.0000	-0.2
	Total tax revenues	0.0000	-0.5	0.0000	-0.8	0.0000	-0.3	0.0000	0.9
	Total tax arrears	0.0000	-0.1	0.0003	1.1	0.0001	0.5	0.0000	0.7
	Gross regional product	0.0000	-0.2	0.00002	1.9	0.00001	1.3	-0.0001	-4.1
Settlement type (Urban as omitted category):									
	Suburban	-0.261	-0.6	0.202	0.5	0.138	0.3	0.648	1.5
	Rural	0.173	0.5	0.503	1.5	0.591	1.9	0.502	1.2
Constant		1.2	0.9	0.0	0.0	-1.3	-0.9	-1.0	-0.7
Observations (#)		832		742		652		571	
Log likelihood		-377		-348		-374		-297	

Notes: The dependent variable is an indicator variable of household wage arrears. The sample is restricted to worker households with children less than 7 years of age from 1994 to 1998.

8.2.4 Identification

The matching estimators rely on two conditions: common support and no selection bias. The first requirement ensures that in the case of matching the counterfactual can be obtained. The second element implies that the factors determining the arrears status should not themselves be correlated with changes in the outcomes of interest. The issues are now discussed in turn.

Common Support

By imposing the common support, I drop those arrears children that cannot be matched to control children. Before kernel matching, the estimated propensity scores for those with and without wage arrears are, respectively, 0.424 (standard error of 0.214) and 0.228 (standard error of 0.171) for boys, and 0.450 (0.208) and 0.239 (0.170) for girls. Imposing the common support leads to a loss of 25 arrears boys and 16 arrears girls, leaving 383 observations of arrears children. After matching, the average propensity scores across the two groups almost coincide (female arrears group: 0.400 (0.009); female non-arrears group: 0.396 (0.009); male arrears group: 0.434 (0.011); male non-arrears group: 0.429 (0.011)).

Selection bias

The matching approach does not correctly identify the impact of wage arrears if arrears households experience shocks apart from wage arrears with an independent effect on child health. I now consider possible causes of such selection bias, similar to the discussions in sections 6.4.2 and 7.2.7.

Selective migration Workers may seek to relocate from high- to low-arrears regions in search of a better job. Table 8.2 shows impact estimates of wage arrears on relocation, missing information and job tenure of workers living in households with children less than 7 years of age, based on the logit regressions of Table 7.1. Overall, about 18 percent of the workers dropped out of the survey in the next round.

About one third of them moved away, and for the bulk of the others the cause of the attrition is missing.[12] For missing observation and relocation, the dropout rate of workers with wage arrears is no higher than for those without wage arrears. The coefficients were close to zero and statistically insignificant. The table also shows the matching estimates of the impact of wage arrears on job changes since end 1993, just prior to the beginning of the wage arrears crisis. About 60 percent of these workers had been employed in their current jobs since before 1994. The job mobility of workers exposed to wage arrears was no higher than those without wage arrears, possibly because workers are afraid of losing back wage entitlements.

Reverse causality Could the deterioration in health status be the cause rather than effect of wage arrears? This is unlikely for two reasons. As argued in Section 7.2.1, wage arrears are primarily explained by regional, sectorial and enterprise characteristics, in addition to worker features, like tenure and qualification level, but are unrelated to health status. Further, the focus is on the health status of children who do not earn wages or incur wage arrears.

Fiscal crisis Another concern is that wage arrears could be just one symptom of a more general decline in well-being of workers and their dependants in certain regions, sectors and enterprises. However, the matching procedure ensures that arrears households are paired with non-arrears households from similar areas. Arrears and non-arrears households are therefore likely to be exposed to similar regional shocks. Section 8.4 will present impact estimates when children are matched only within their own state. Second, I can study the impact of certain measures directly to see whether they can account for lower health status of arrears children. The most obvious issue is whether arrears households lose social entitlements. The RLMS reports on a number of such programs. As shown in the top part of Table 8.3, the differences in outlays between arrears and non-arrears children were too small to be economically important.

[12]Information on individuals missing from the previous survey round is provided by other household members. If entire households drop out of the survey, then no information on the reason is available.

Table 8.2: Wage arrears, worker attrition and job tenure

	Coef (1)	t-stats (2)
Missing observation (t+1)?	-0.008	-0.7
Moved away (t+1)?	0.006	0.6
Job tenure since end 1993?	0.008	0.5
Observations (#)	3067	

Notes: Workers with wage arrears in households with children are compared to workers without wage arrears in households with children according to Gaussian kernel matching, based on the propensity scores derived from the logit regressions of Table 8.1. The coefficients are impact estimates of wage arrears on workers with wage arrears.

The total effect on government benefits is statistically insignificant, and amounts to no more than one percent of household income.

Table 8.3: Wage arrears, government transfers and self-assessed environment

	Boys				Girls			
	Coef (1)	t-st (2)	Coef (3)	SE (4)	Coef (5)	t-st (6)	Coef (7)	SE (8)
Government transfers (per capita)								
All benefits	-28	-1.4	181	16	-26	-1.7	149	13
Pensions	-10	-0.6	119	13	-18	-1.5	87	10
Unemployment benefits	4	0.7	7	4	-1	-1.5	1	1
Child benefits	-17	-2.2	52	5	-6	-0.9	55	7
Fuel benefits	-1	-2.6	1	0	0	0.0	2	2
Apartment benefits	-2	-2.4	2	1	0	-0.3	2	1
Grants	-1	-1.6	1	1	-1	-0.5	2	1
Environment								
Family member chronically ill due to pollution?	0.020	0.9	0.191	0.022	-0.009	-0.5	0.159	0.018
Deterioration in garbage collection	0.02	0.6	2.1	0.04	-0.05	-1.1	2.0	0.04
Deterioration in air quality	0.03	0.9	2.3	0.02	0.00	-0.1	2.3	0.02
Using new method for cleaning air?	0.038	2.8	0.078	0.014	0.009	0.9	0.040	0.009
Deterioration in water quality	0.03	1.2	2.3	0.03	0.05	1.8	2.3	0.02
Using new method for cleaning drinking water?	-0.014	-0.5	0.274	0.021	-0.060	-2.0	0.232	0.019
Willing to pay government for clean air or water?	-0.019	-0.6	0.376	0.023	-0.031	-1.0	0.369	0.023
Observations (#)	1267				1265			

Notes: The children in arrears households are compared to the children in non-arrears households according to Gaussian kernel matching, based on the propensity scores derived from the logit regressions of Table 8.1. The sample is restricted to worker households. The coefficients in columns 1 and 5 are impact estimates of wage arrears on the children in arrears households. The coefficients in columns 3 and 7 are the level estimates for the children in arrears households.

Pollution Another possible cause for the poor child health is pollution of the environment. The RLMS asked household heads to assess changes in a range of environmental factors, as shown in the bottom part of Table 8.3. Compared to the control group, heads of households in wage arrears families believed that environmental conditions have either improved, or changed little over the 12 months preceding the survey. The only exception is water pollution, which was rated by heads of arrears girls as about 5 percent worse than by those in the control group. However, this deterioration did not lead arrears households to adopt new methods for cleaning air, possibly suggesting that air pollution may not have worsened severely. Furthermore, the incidence of chronic diseases of family members due to pollution was not significantly different between arrears and non-

arrears families. Finally, arrears households also displayed no higher willingness to pay the government for clean air or water. Overall, based on these assessments, arrears children were not exposed to systematically higher pollution.

8.3 Results

8.3.1 Economic Impact

The wage arrears crisis had a dramatic impact on living standards and child health. Table 8.4 displays the levels before and after wage arrears separately for the treatment and control group. Families were highly dependent on wages which accounted for close to two thirds of household income. Wage arrears reduced wage income of the treatment group by between R700 to R766 per capita (PPP$295 to PPP$320),[13] or by almost 60 percent. For boys in arrears households, income from home production and financial income also declined. The overall reduction in per capita income was almost 20 percent higher than per capita wages and equalled to close to half of household income. By contrast, arrears girls benefited from a rise in home production and little change in financial income, and the drop in income was slightly less than the one of wages, and equal to about 40 percent of household income. Poverty rose by three quarters for girls and doubled for boys, leaving more than two thirds of the arrears children in households with inadequate means to afford basic necessities.

8.3.2 Coping Strategies

This section takes a closer look at three types of household responses to wage arrears, namely labour supply, sales and borrowing and private transfers. Taking into account various behavioural adjustments, households were only able to compensate for part of the wage income shock. The amount is equal to one quarter of the wage decline for boys, and one seventh for girls. Adding the changes in other income

[13] All Ruble values refer to prices as of June 1992.

Table 8.4: Wage arrears and living standards (Ruble per capita)

	Boys				Girls			
	Impact		Level		Impact		Level	
	Coef (1)	t-st (2)	Coef (3)	SE (4)	Coef (5)	t-st (6)	Coef (7)	SE (8)
Wages	-766	-12	611	60	-700	-10	539	50
Government transfers	-28	-1.6	181	15	-26	-1.7	149	13
Home production	-115	-3.4	231	27	80	2.6	302	34
Financial income	-53	-2.8	0.5	0.3	-2	-1.1	3	2
Income	-961	-12	1024	63	-648	-9.1	993	49
Income poverty (%)	0.349	12	0.687	0.023	0.296	10	0.679	0.022
Observations (#)	1267				1265			

Notes: The children in arrears households are compared to the children in non-arrears households according to Gaussian kernel matching, based on the propensity scores derived from the logit regressions of Table 8.1. The sample is restricted to worker households. The coefficients in columns 1 and 5 are impact estimates of wage arrears on the children in arrears households. The coefficients in columns 3 and 7 are the level estimates for the children in arrears households.

sources as discussed in the last section, arrears households with boys incurred a net resource loss equal to the drop in wages, while arrears households with girls managed to compensate one fifth of the wage reduction.

Labour Supply

To the extent that wage income is shared among household members, standard labour supply theory suggests that the wage arrears shock can affect labour supply of all adult members of the arrears household. In arrears families, more than one third of the members were employed, and each worker held about 1.2 formal or informal jobs. The top part of Table 8.5 shows that total number of job holdings per worker remains unchanged in arrears households relative to non-arrears households. The total number of hours worked per worker during the last month and last week (from the time usage section of the RLMS) declined by about 10 percent for workers in households with boys, and increased by about 5 percent in households with girls. The failure of a labour supply response is likely to be related to the dire job market situation. Official unemployment rates were close to 10 percent and three fifths of the workers were 'very' or 'fairly' concerned about losing their job. Two thirds of the workers believed that in case of a job loss it would be 'absolutely uncertain' or 'fairly uncertain' that they would find another job.

Private Transfers

If members of different households care about each others consumption, a decline in income of one family should trigger an increase in transfers received from other households. Private transfers are widespread. More than six out of ten households were involved in receiving or giving transfers. With transfers in Russia typically going from old to young, households with children received more than they give, and the net effect was an increase of almost one fifth of household income of participating families. As shown in the middle part of Table 8.5, households gave less frequently and lower amounts but received more often and higher amounts in response to wage arrears. Overall, boys living in arrears households experienced a net

Table 8.5: Wage arrears and household coping strategies

	Boys				Girls			
	Impact		Level		Impact		Level	
	Coef (1)	t-st (2)	Coef (3)	SE (4)	Coef (5)	t-st (6)	Coef (7)	SE (8)
Income with transfers, sales etc. (per capita)	-773	-6.8	1577	97	-552	-6.0	1353	67
Employment (per worker)								
Jobs (#)	-0.01	-0.4	1.23	0.03	0.00	-0.1	1.23	0.02
Hours worked last month	-18	-4.6	155	4	8	1.8	168	3
Hours spent working last week	-5	-4.2	41	1	3	2.5	46	1
Private transfers								
Private transfers given?	-0.086	-2.8	0.405	0.025	-0.029	-1.0	0.396	0.025
Transfers given if given (per capita)	-30	-0.5	313	49	-55	-0.5	415	89
Private transfers received?	0.012	0.4	0.332	0.023	0.044	1.7	0.321	0.022
Transfers received if received (per capita)	25	0.2	604	96	63	0.5	629	106
Net transfers (per capita)	21.004	0.4	75	38	26	0.4	22	44
Sales and borrowing								
Sold jewelry or property?	0.007	0.4	0.319	0.02	-0.022	-1.3	0.290	0.02
Borrowing?	0.098	4.0	0.339	0.02	0.047	1.8	0.297	0.02
Unpaid rent or utility bills?	0.094	4.3	0.342	0.02	0.109	4.2	0.343	0.03
Sales, borrowing, unpaid bills (per capita)	168	2.8	478	54	70	1.9	338	39
Observations (#)	1267				1265			

Notes: The children in arrears households are compared to the children in non-arrears households according to Gaussian kernel matching, based on the propensity scores derived from the logit regressions of Table 8.1. The sample is restricted to worker households. The coefficients in columns 1 and 5 are impact estimates of wage arrears on the children in arrears households. The coefficients in columns 3 and 7 are the level estimates for the children in arrears households.

transfer increase in absolute terms of about 4 percent, and girls of about 11 percent.

Sales and Borrowing

A negative income shock should lead to dissaving or borrowing in order to bring consumption in line with the lower level of permanent income. As shown in the bottom part of Table 8.5, about 30 percent of households were engaged in asset sales, borrowing, or delaying payments of rent and utility bills. In response to wage arrears, there was little change in the sales of jewellery and property, but a sharp increase of up to 10 percent of households engaged in borrowing, or running up rental payment arrears. The impact amounted to 22 percent of the reduction in wages in arrears households with boys, and to 10 percent of the wage loss in arrears households with girls.

8.3.3 Health Impact

The preceding section documented that arrears children experienced a drop of about 40 to 50 percent of household income, and a 75 percent to 100 percent rise in poverty. This section investigates the health implications of this income shock, along the lines of Section 7.4. I take a closer look at health services and health behaviours (Table 8.6), sickness and physical activity (Table 8.7), food purchases (Table 8.8), nutrition (Table 8.9) and anthropometric status (Table 8.10).

Health Service

As explained in Section 7.3.3, the bulk of the health service is funded through the compulsory medical insurance system. Basic health care is free of charge, even though the system is chronically underfunded. Access to health services was no worse for arrears children than non-arrears children.[14] Table 8.6 shows that about four in ten boys and

[14]There is no information in the RLMS on the quality of health service. For example, Barber and Gertler (2002) find that in Indonesia the quality of child care processes are positively associated with child growth, while access variables are not.

girls had health problems during the last month. Among those, between 50 to 60 percent went to see a doctor, most of whom are public doctors, and almost nobody paid for the treatment. A similar percentage obtains prescriptions, and about one third of girls and 60 percent of boys received them for free. Close to three in ten children went for a general health check up during the last three months, and, again, almost nobody paid for the treatment. Based on these access indicators, the wage arrears crisis was not accompanied by a deterioration in health services provided to arrears children. Arrears children relied also more often on public doctors, and were less likely to pay for health treatment, perhaps due to the larger coverage with medical insurance.

Table 8.6: Wage arrears and access to health service

	Boys				Girls			
	Impact		Level		Impact		Level	
	Coef	t-st	Coef	SE	Coef	t-st	Coef	SE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Health problem last month?	0.028	1.1	0.389	0.029	-0.009	-0.3	0.389	0.025
Treatment if health problem last month?	-0.023	-0.5	0.579	0.037	0.074	1.5	0.608	0.039
Public doctor, if treatment?	-0.073	-1.0	0.538	0.059	0.150	2.1	0.663	0.054
Paid, if treatment?	-0.010	-0.6	0.013	0.014	-0.012	-2.0	0.000	0.000
Prescription if health problem last month?	0.0018	0.0	0.529	0.043	0.079	1.8	0.545	0.046
Paid, if prescription?	-0.188	-2.7	0.609	0.051	-0.039	-0.6	0.684	0.052
Went for check-up last 3 months?	0.018	0.7	0.282	0.025	0.001	0.0	0.280	0.021
Public doctor, if check-up?	0.030	1.1	0.969	0.018	0.000	1.1	1.000	0.021
Paid, if check up?	-0.032	-1.1	0.020	0.013	0.010	0.9	0.010	0.010
Vaccination last 3 months?	0.040	1.5	0.324	0.025	-0.041	-1.5	0.356	0.026
Paid if vaccination last 3 months?	-0.018	-1.7	0.000	0.000	-0.002	-0.1	0.032	0.016
Medical insurance?	0.050	1.9	0.577	0.025	0.072	3.0	0.596	0.022
Observations (#)	1267				1265			

Notes: The children in arrears households are compared to the children in non-arrears households according to Gaussian kernel matching, based on the propensity scores derived from the logit regressions of Table 8.1. The sample is restricted to worker households. The coefficients in columns 1 and 5 are impact estimates of wage arrears on the children in arrears households. The coefficients in columns 3 and 7 are the level estimates for the children in arrears households.

Sickness and Physical Activity

Table 8.7 shows two separate inputs into anthropometric status. Wage arrears could be associated with sickness, which in turn may

retard child growth.[15] Yet, there was no evidence of an increase in colds, diarrhoea, congestion, sore throat, teething, or earaches as a result of wage arrears. Similarly, children with and without wage arrears engaged in similar amounts of regular physical activity, suggesting that child development is not hampered by lack of sports, out-door activities and the like.

Table 8.7: Wage arrears, sickness and physical activity in the last 7 days

	Boys				Girls			
	Impact		Level		Impact		Level	
	Coef (1)	t-st (2)	Coef (3)	SE (4)	Coef (5)	t-st (6)	Coef (7)	SE (8)
Cough	0.014	0.4	0.310	0.030	-0.069	-1.9	0.289	0.024
Diarrhea	-0.004	-0.3	0.037	0.010	0.007	0.6	0.025	0.010
Congestion	-0.026	-0.8	0.293	0.026	-0.030	-0.9	0.347	0.028
Sore throat	-0.028	-1.1	0.112	0.018	-0.003	-0.1	0.144	0.021
Teething	0.015	0.8	0.101	0.021	0.024	0.9	0.126	0.020
Earache	0.008	0.6	0.030	0.011	-0.018	-1.6	0.014	0.007
Regular physical activities (hours/week)	0.2	0.4	1.8	0.424	0.1	0.7	1.3	0.194
Observations (#)	1267				1265			

and consumed food more often at home. They also reduced their expenses of eating out by one fifth to one quarter, and cut back on food purchases by 12 to 16 percent. While these are remarkable savings, they made up no more than 7 to 9 percent of the wage arrears shock. Households also limited outlays not evenly across food groups. Arrears households with boys increased the share of bread and potato expenses in food purchases by 6.5 percent, and lowered purchases of fish, meat, fats, fruits and vegetables. Similarly, arrears households with girls cut back on purchases of dairy products, meat, fruits and vegetables.

Table 8.8: Wage arrears and food purchases

	Boys				**Girls**			
	Impact		Level		Impact		Level	
	Coef (1)	t-st (2)	Coef (3)	SE (4)	Coef (5)	t-st (6)	Coef (7)	SE (8)
Eating out (per capita)	-22	-1.3	89	13	-23	-2.0	74	11
Food prepared at home (%)	0.035	2.1	0.666	0.015	0.030	1.9	0.662	0.013
Food eaten at home (%)	0.025	1.8	0.852	0.015	0.015	0.9	0.838	0.016
Food purchases (per capita)	-30	-2.3	223	12	-40	-3.0	205	11
Of which (%):								
Dairy	0.017	2.2	0.111	0.006	0.010	1.4	0.108	0.007
Meat	-0.024	-1.8	0.204	0.010	-0.032	-2.3	0.189	0.010
Fish	-0.001	-0.3	0.023	0.005	0.009	3.0	0.026	0.003
Potato	0.001	0.2	0.011	0.003	-0.003	-0.8	0.012	0.003
Bread	0.065	4.3	0.315	0.015	0.023	1.4	0.294	0.013
Eggs	-0.001	-0.4	0.022	0.002	0.008	2.3	0.034	0.003
Fat	-0.028	-3.7	0.068	0.006	0.007	1.1	0.090	0.006
Fruits	-0.003	-0.6	0.056	0.005	0.001	0.1	0.054	0.005
Sugar	-0.022	-2.3	0.108	0.009	-0.008	-0.8	0.114	0.009
Vegetables	0.006	0.9	0.041	0.006	-0.007	-1.4	0.029	0.004
Other food	-0.009	-2.1	0.042	0.004	-0.007	-1.6	0.048	0.004
Observations (#)	1267				1265			

Notes: The children in arrears households are compared to the children in non-arrears households according to Gaussian kernel matching, based on the propensity scores derived from the logit regressions of Table 8.1. The sample is restricted to worker households. The coefficients in columns 1 and 5 are impact estimates of wage arrears on the children in arrears households. The coefficients in columns 3 and 7 are the level estimates for the children in arrears households.

Nutrition

A detailed breakdown of the impact of wage arrears on nutritional status is shown in Table 8.9. This analysis draws on comprehensive food intake data based on 24-hour food recall, covering all meals irrespective of where they were consumed (home, work, friends, or school) and how they were obtained (purchase, home production, or donation).

Energy needs of growing children are high. The basal metabolic requirement of children is up to 25 percent higher than that of adults, and the superimposed incessant muscular activity of active children calls for large caloric expenditure. Wage arrears led to a decline in caloric intake by 30 kilocalories (kcal) to 1440 kcal per day for boys, and by 90 calories to 1250 kcal per day for girls. The exact energy requirements of each child are difficult to determine, and depend among others on body size, metabolic efficiency and physical activity. To obtain a rough estimate on caloric adequacy, I assume that caloric requirements rise between 1 to 7 years of age from 740 kcal per day to 2180 kcal per day for boys, and 660 kcal per day to 1960 kcal per day for girls (Burton and Foster 1988). This would imply that about one in ten children were deficient in caloric intake.

Wage arrears resulted in lower provision not just of energy but also of nutrients. In fact, the percentage reductions of caloric intake (2 percent for boys and 7 percent for girls) were lower than the percentage reductions for the proteins, vitamins (with the exception of thiamin for boys) and minerals listed in Table 8.9. This is a sign of the deterioration in the nutritional quality of the diet, possible as a result of changing the food composition towards a cheaper diet.

Children have higher protein requirements than adults relative to body weight as they need to add body tissue. In line with the larger reduction in calories, protein intake fell especially for girls but the levels remained on average above the RDA of between 16 to 24 grams for children of 1 to 6 years of age.[16]

[16]If energy needs are not met, protein needs are higher because some of the protein is diverted for energy production (Deutsch and Morrill 1993). The Recommended Dietary Allowance (RDA) are developed by the Food and Nutrition Board of the US National Academy of Science (www.nal.usda.gov/fnic).

Table 8.9: Wage arrears and nutrition

	Boys				Girls			
	Impact		Level		Impact		Level	
	Coef	t-st	Coef	SE	Coef	t-st	Coef	SE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Energy (kcal)	-29	-0.8	1442	25	-91	-2.8	1253	28
Calorie-providing nutrients								
Protein (g)	-1.3	-1.2	42	0.8	-3.2	-3.7	36	0.8
Fat (g)	-0.2	-0.1	48	1.3	-6.6	-4.2	42	1.0
Vitamins								
Vitamin A (IU)	-384	-2.9	728	100	-211	-2.3	584	63
Thiamin (mg)	-0.006	-0.3	0.637	0.014	-0.090	-5.2	0.568	0.013
Riboflavin (mg)	-0.023	-1.0	0.810	0.023	-0.102	-4.2	0.719	0.019
Vitamin C (mg)	-7.2	-2.2	99	3.2	-4.5	-1.8	87	2.1
Minerals (mg)								
Calcium	-24	-1.3	492	13	-48	-2.8	470	15
Magnesium	-7.8	-1.4	198	4.6	-30	-5.0	167	3.9
Iron	-1.0	-3.0	10.0	0.2	-2.3	-4.5	8.7	0.2
Weight measures								
Weight for age	0.029	0.3	0.365	0.069	0.019	0.2	0.341	0.077
Wasted?	0.011	1.0	0.036	0.011	0.010	1.0	0.033	0.009
Observations (#)	1267				1265			

Notes: The children in arrears households are compared to the children in non-arrears households according to Gaussian kernel matching, based on the propensity scores derived from the logit regressions of Table 8.1. The sample is restricted to worker households. The coefficients in columns 1 and 5 are impact estimates of wage arrears on the children in arrears households. The coefficients in columns 3 and 7 are the level estimates for the children in arrears households.

While there is no RDA for fat, the body requires essential fatty acids. Fat is a concentrated source of calories and a reserve of energy for periods of low caloric intake. However, there is little reason to eat fat for the well-fed child. The needs for essential fatty acids are met by as little as a tablespoon of vegetable oil per day. Even with wage arrears, children received over 30 percent of their calories from fats, far in access of this requirement.

Turning to vitamins, vitamin A (retinol) is crucial in maintaining various tissues and vision. The required intake of vitamin A ranges from 1,250 International Units (IU) for infants to 1,800 IU for children of 7 years of age. Children were clearly deficient in vitamin A, aggravated through reductions of between 27 to 35 percent as a result of wage arrears. Thiamin plays a central role in the metabolism of both carbohydrate and protein, and is essential for the proper functioning of the nervous system. The proportional drop in thiamin intake was especially large for girls, and levels were below the RDA of 0.7 to 1.0 mg. Similarly, riboflavin provision, which is important to energy metabolism, eyesight and skin, contracted more for girls than boys, and the average intake was below the RDA of 0.8 to 1.2 mg for children aged 1 to 7 years. These vitamins are provided among others by meats, vegetables and fruits, suggesting that these losses were partly related to adjustments of food purchases as described in Table 8.8. Finally, vitamin C (ascorbic acid) is essential in maintaining the integrity of connective tissue. Vitamin C intakes dropped significantly, but the levels remained on average about twice as high as the RDA of 35 to 45 mg.

In terms of minerals, calcium is required for bone and teeth structure, and to support muscle and nerve functions. Children need proportionately large amounts as their skeletons are growing. The RDA for children up to 7 years is 800 mg, which is far above the levels recorded in Table 8.9. Wage arrears led to an additional 5 to 9 percent reduction in calcium intake, worsening existing deficiencies. In this context, the reduced food purchases of dairy products were of particular concern as dairy foods provide high-quality calcium in a form that the body can absorb quickly.

Magnesium fulfils various roles, including supporting body enzymes and maintaining nerve and muscle cells. Intakes in Russia

were above the RDA of 80 to 170 RDA for children without wage arrears, but wage arrears brought girls on average close to the upper end of this range.

Children require iron for increasing blood volume and growing bodies. Iron deficiency arises from a decreased ability of the blood to transport oxygen to tissues, and can result in impaired mental development. The RDA for children is 10 mg, irrespective of age. Wage arrears reduced iron intake by 9 to 21 percent. As a result, boys consumed on average just the required amount, and girls had a shortage of 13 percent.[17] The drop in iron intake was related to lower purchases of iron-rich foods, including meat, fish (for boys) and fruits.

As shown in the last two rows of Table 8.9, the deterioration in the diet led to a rise in acute malnutrition. The incidence of wasted children increased by 1 percent to 3.6 percent for boys and 3.3 percent for girls. However, while this suggests a large proportional increase in wasting, the changes are not statistically significant.

Breast-feeding and nutrient supplements

Feeding practices during the first years of age have an important influence on the nutritional and growth status of the young child.[18] Breastmilk is generally higher in most nutrients than other food available to young infants, and nutrient intake will be lower when other foods are introduced too early. Exclusive breast-feeding is recommended for the first 6 months of life. In Russia, one in four children aged less than 6 months of age are no longer currently breast-fed, rising to one in two among children less than 12 months. Wage arrears increased (although not statistically significant) the breast-feeding of children less than 24 months of age (Table 8.10), possibly due to the efforts of parents to economize on expenses for baby food.

[17]This finding confirms the results reported in Kohlmeier et al. (1998), using the first four rounds of the RLMS during 1992 to 1994.

[18]Undernutrition, smoking, alcohol, and drug abuse of the mother at conception and during pregnancy may already have strongly adverse influences on early growth of her foetus, and increases the risk of subsequent growth stunting of the infant and young child (Allen and Gillespie 2001).

Nevertheless, more than three in four arrears children in this age-bracket are not breast-fed.

Table 8.10: Wage arrears, breast-feeding and food supplementation

	Boys				Girls			
	Impact		Level		Impact		Level	
	Coef (1)	t-st (2)	Coef (3)	SE (4)	Coef (5)	t-st (6)	Coef (7)	SE (8)
Mother currently breast-feeding? (with children less than 24 months old)	0.065	1.3	0.219	0.057	0.030	0.4	0.250	0.056
Took multi-vitamins?	0.003	0.2	0.157	0.021	-0.031	-1.3	0.134	0.017
Took individual vitamins?	0.015	0.8	0.157	0.018	-0.010	-0.5	0.157	0.019
Took mineral supplements?	0.012	1.2	0.039	0.011	-0.009	-1.0	0.018	0.006
Observations (#)	1267				1265			

Notes: The children in arrears households are compared to the children in non-arrears households according to Gaussian kernel matching, based on the propensity scores derived from the logit regressions of Table 8.1. The sample is restricted to worker households. The coefficients in columns 1 and 5 are impact estimates of wage arrears on the children in arrears households. The coefficients in columns 3 and 7 are the level estimates for the children in arrears households.

Another way to improve the dietary balance of children is to supplement food intake by specific micronutrients. As shown in Table 8.10, about 15 percent of children received vitamin supplements, and about 3 percent mineral supplements. In response to wage arrears, there were slight variations in the share of children receiving supplementation, but the changes remained insignificant.

Young Children

Physical growth of children is highly dependent on adequate intakes of energy and nutrients. For example, almost one in 6 of the calorie-deficient children are stunted, compared to only one in eleven among children who receive adequate calories. This suggests that wage arrears may result not just in a decline of the nutritional balance but also a deterioration of the anthropometric status.

Table 8.11 shows the impact of wage arrears on the main economic, nutritional and anthropometric variables for children up to 3 years of age. The reduction in wage and income was somewhat larger for the whole sample in terms of both the absolute size of the shock

and the proportional decline. While the drop in energy intakes of 5 percent was about the same to before, young children display even worse iron deficiency. Among arrears children, the shortfall compared to RDA increased from 26 percent to 37 percent. HFA scores doubled and stunting rates rose by over 60 percent. The prevalence of stunted children in arrears households increased to 14 percent.

8.4 Sensitivity Analysis

This section will explore the robustness of the findings with regard to the definition of wage arrears and alternative estimation specification and methods. In order to focus on the impact on growth status, I present statistics for the group of children up to 3 years of age.

8.4.1 Definition of Wage Arrears

Households with wage arrears are defined as households with at least one member who is owed wages and has no wage payment during the last 30 days. All other families are non-arrears households. Table 8.12 displays impact and level statistics on dimensions of wage arrears for children up to 3 years of age. Arrears children lived in households whose wage arrears are more than two thirds as high in terms of the outstanding monthly wage payments per capita, and about double in terms of the amount of wage arrears in Ruble per capita and the number of workers with wage arrears in the household. While only one in four workers in arrears households had received wage payments during the last 30 days, about 19 in 20 workers had done so in non-arrears households. Therefore, the non-arrears group contains many children living in households with outstanding wage claims. Including these persons may dilute impact estimates as it blurs the distinction between arrears and non-arrears groups.

In Table 8.13, the first set of results present impact estimates when arrears children are matched only to children from households that are not owed any wages. The number of control children declines from 754 to 435, while the number of treatment children stays the

Table 8.11: Wage arrears and children up to 3 years of age

	Impact		Level	
	Coef	t-st	Coef	SE
	(1)	(2)	(3)	(4)
Wage per capita	-889	-11	442	51
Income per capita	-902	-10	879	54
Energy (kcal)	-47	-1.3	996	28
Iron	-1.1	-2.8	6.3	0.2
Height for age	-0.206	-1.5	-0.395	0.125
Stunted?	0.056	2.0	0.143	0.023
Observations	1052			

Notes: The children less than 3 years of age in arrears households are compared to the children less than 3 years of age in non-arrears households arrears according to Gaussian kernel matching, based on the propensity scores derived from the logit regressions of Table 8.1. The sample is restricted to worker households. The coefficients in Column 1 are impact estimates of wage arrears on the children in arrears households. The coefficients in Column 3 are the level estimates for the children in arrears households.

Table 8.12: Definition of wage arrears

	Impact		Level	
	Coef	t-st	Coef	SE
	(1)		(2)	
Outstanding wage payments				
Month per capita	0.46	4.4	1.13	0.07
Ruble per capita	1306	4.5	2605	243
# per worker	0.44	16	0.89	0.01
No wage payment last 30 days				
# per worker	0.76	39	0.81	0.02
Observations (#)	1052			

Notes: The children less than 3 years of age in arrears households are compared to the children less than 3 years of age in non-arrears households according to Gaussian kernel matching, based on the propensity scores derived from the logit regressions of Table 8.1. The sample is restricted to worker households. The coefficients in Column 1 are impact estimates of wage arrears on the children in arrears households. The coefficients in Column 3 are the level estimates for the children in arrears households.

same.[19] The size of the wage arrears shock is 20 percent larger in absolute amounts than before but comparable relative to the wage level. The impact on HFA is larger and the one on stunting smaller, but it still suggests a rise in the prevalence of stunted children by over 40 percent.

8.4.2 Matching Techniques

Alternative estimation

How robust are the impact estimates to variations in the estimation approach? Table 8.13 shows four variations to the basic results. As argued in Section 7.2.1, wage arrears are concentrated in certain regions. To eliminate the impact of differential regional trends, Panel B shows matching estimates where treated observations are matched only to observation within the same state. The estimated drop in wages is similar compared to before, while the impact on growth status is larger. Panel C includes as additional regressors in the matching equation the height of the father and mother. These variables control for one aspect of genetic endowments that influence the growth status of children. Due to missing information on parental height, the number of observations declines from 1052 to 896. The estimates are similar to the basic results, although the impact on height for age is no long significant at the 10 percent level.

The next panel concerns an alternative cross-sectional matching estimators. The nearest neighbour estimator pairs each treated observation with the control observation that has the closest propensity score. The impact on wage is similar to before, while the effect on HFA scores and stunting is larger.

Difference-In-Differences Matching

The matching techniques used so far have not exploited the panel dimension of the data set. Difference-In-Differences matching (DIDM) is a modified version of cross-sectional matching drawing on the sample of children with observations from two consecutive rounds. Ar-

[19]The estimates on mean values compared to the full sample change nevertheless due to a slight variation in the number of matched treatment children.

Table 8.13: Wage arrears and child growth status: sensitivity analysis

	Impact		Level	
	Coef (1)	t-st (2)	Coef (3)	SE (4)
(A) Non-arrears controls (733 observations)				
Wage per capita	-1070	-9.5	464	59
Height for age	-0.295	-1.7	-0.388	0.126
Stunted?	0.043	1.2	0.143	0.030
(B) Same state only (1052 observations)				
Wage per capita	-849	-7.3	367	48
Height for age	-0.292	-1.6	-0.393	0.138
Stunted?	0.070	1.8	0.148	0.032
(C) Parental height (896 observations)				
Wage per capita	-721	-11	394	40
Height for age	-0.248	-1.5	-0.390	0.122
Stunted?	0.046	1.3	0.133	0.025
(D) Nearest neighbour (1052 observations)				
Wage per capita	-869	-7.4	469	45
Height for age	-0.325	-2.5	-0.481	0.101
Stunted?	0.061	2.2	0.147	0.024
(E) DID matching (616 pairs of observation)				
Wage per capita	-308	-2.3	707	115
Height for age	-0.302	-1.9	-0.097	0.127
Stunted?	0.039	1.0	0.079	0.024

Notes: The children less than 3 years of age in arrears households are compared to the children less than 3 years of age in non-arrears households, based on the propensity scores derived from the specification of the logit regressions of Table 8.1. The sample is restricted to worker households. The coefficients in Column 1 are impact estimates of wage arrears on the in arrears households. The coefficients in Column 3 are the level estimates for the children in arrears households. Apart from Panel D, the estimates refer to Gaussian kernel matching. Panel A refers to the whole control group; Panel B to children within the same state only; Panel C includes parental height as determinant of the logit regressions; Panel D refers to Nearest Neighour matching; and Panel E to DID matching for children up to 5 years of age.

rears children live in households with no wage arrears in the initial (pre-arrears or pre-intervention) period and with wage arrears in the subsequent (post-arrears or post-intervention) period. The control group contains children living in households without wage arrears in both pre- or post-arrears period. The identifying assumption is that the matched control group evolve from the pre- to post-arrears period in the same way as the treatment group would have done in the absence of arrears. As with simple matching, treated observations are matched to non-treated observations using propensity scores. To ensure that the matching is not affected by the assignment to arrears status, the propensity scores are based on the characteristics of the pre-intervention period only.

The additional data requirements led to a loss in sample size relative to cross-sectional matching. DIDM estimation relies also on a comparison of the change from pre- to post-intervention period of the treatment group relative to the control group, which implies that only one impact estimate is derived for each pair of observations. To ensure an adequate sample size, I include children up to 5 years of age in the pre-intervention period. The sample contains 616 pairs of children, among which are 164 pairs of arrears children. In spite of the extended age-bracket, DIDM relies on only half of the number of impact estimates compared to cross-sectional matching.

The final set of results in Table 8.13 shows the impact estimates based on DIDM estimation, in line with Equation 2.18. The decline in wages was only about one third of the drop estimated with cross-sectional matching. In spite of the lower income shock, the increase in HFA score was larger and statistically significant. Furthermore, stunting rates rose by 3.9 percent, almost halting the trend decline in stunting prevalence as children grow older. Among the arrears children, stunting rates dropped from 8.7 percent to 7.9 percent between pre- and post-intervention period , compared to a reduction from 7.9 percent to 2.6 percent for control children. Due to the small sample size, only the impacts on HFA are statistically significant.

8.5 Conclusion

Wage arrears worsened the welfare of children less than 7 years of age in Russia during the mid-1990s. Households with wage arrears experienced salary losses of almost 60 percent and a doubling in poverty. Behavioural responses to compensate for the income reduction through higher labour supply, private transfers, sales of durables, or borrowing were partly successful, generating about one quarter of the wage decline for boys and one seventh of the wage reduction for girls. Adding changes in other sources of income, the net loss was the same amount as the wage drop for boys, and four fifth of the wage decline for girls.

Wage arrears led to a deterioration in health among affected children. Children with wage arrears had lower intakes of calories and a worse nutritional balance than children without wage arrears, althoug the impacts on caloric intake were typically not significant. This contributed to deficiencies in the provision of vitamin A, thiamin, riboflavin, calcium and iron among arrears children. The deterioration in the diet also increased wasting by about 1 percent for boys and girls from around 2.5 percent, but the coefficients are not statistically significant. More importantly, the stunting prevalence among arrears children up to 3 years of age increased in the basic estimation from 8.7 percent to 14.3 percent. While the coefficient estimates depend on the specific estimation technique and sample restriction adopted, stunting rates increase no less than 3.9 percentage points, and the rise in HFA scores is in most cases statistically significant.

I have used a rich data set to exclude alternative causes than the non-payment of wages for the worse growth status of children with wage arrears. Access to health service, child sickness, physical activity, variation in regional living standards or environmental factors do not account for the differences in child height. The findings suggest that wage arrears led to growth retardation through a decline in energy provision and a deterioration in several micronutrient deficiencies.

Chapter 9

Conclusion

The last chapter brings together some of the main findings of Part II. It brings together the key results, compares impact estimates and draws policy conclusions.

9.1 Findings

This section brings together some of the main empirical findings. While the differences highlighted in Table 1.1 make a comparison of point estimates across chapters problematic, it is still instructive to look at the sign and magnitude of key coefficients. Figure 9.1 to 9.8 present the comparisons. The numbers for Chapter 5 compare 1998 outcomes to counterfactual outcomes assuming government transfers at 1994 levels. The other numbers refer to the treatment effect estimates on the treated, i.e. households with pension arrears in 1996 for Chapter 6, households with elderly and wage arrears from 1994 to 1998 for Chapter 7 and households with children and wage arrears from 1994 to 1998 for Chapter 8. The coefficients are obtained from the basic OLS or probit estimations (Chapter 6) or cross-sectional matching estimation (Chapters 7 and 8).[1]

[1] To ensure comparability to the wage arrears analysis, the conclusion includes additional estimates for Chapter 5 and Chapter 6.

9.1.1 Income shock

Figure 9.1 displays the broad measure of income, which includes wages, government transfers, home production, financial income, receipts from assets sales, borrowing, unpaid bills and private transfers.[2] The height of the columns corresponds to per capita income without arrears of the arrears group. It has three components. 'Other income', marked by the bold parts of the columns, refers to the outcome with arrears for the arrears group. 'Endogenous response', displayed in white, shows the income mobilized by arrears households in response to arrears. 'Impact', displayed as the shaded area, represents the net change in income due to arrears.[3] The size of the income shock, as a percentage of broad income, was somewhat higher for pension arrears (39 percent) than for wage arrears (35 percent for both household types). The reduction in government transfers between 1994 and 1998 amounted to close to 20 percent of 1994 household income.

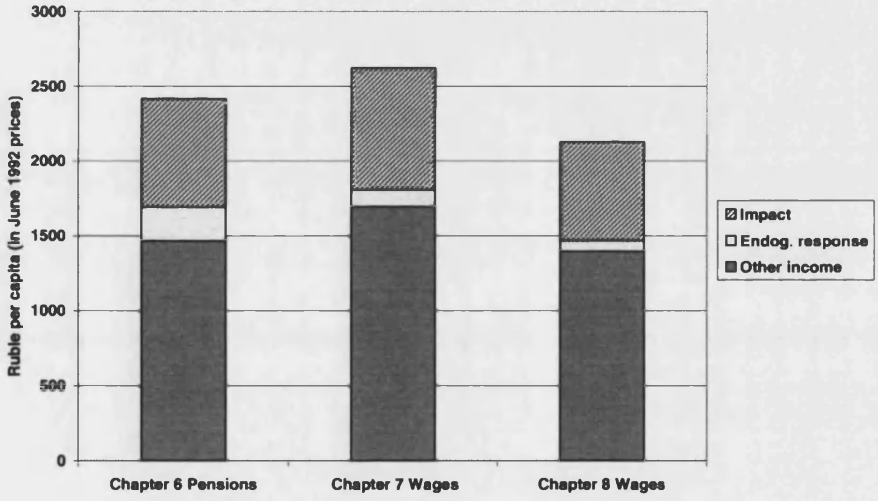
9.1.2 Endogenous response

Households managed to compensate part of the income shock from other sources. Pensioners were hit hardest by the arrears shock but responded most effectively in terms of raising additional revenues. Pensioner households replaced almost one quarter of the pension shock, while worker households mobilized additional revenues of no more than 10 to 12 percent (Figure 9.1). This might be related to the fact that the pension arrears crisis was more short-lived than the wage arrears crisis and allowed for a labour supply response.

[2]Figure 9.1 is based on tables 6.10, 7.9, 7.10, 8.4 and 8.5. For example, Column 'Chapter 7 Wages' has a height of 2618 Ruble per capita, which is equal to the gender weighted average of non-arrears income levels: (1810*(831+1873)+2815*(1758+805))/(1810+2815). The impact equals 815, which is equal to the gender weighted average of the reduction in income due to arrears: (1810*831+2815*898)/(1810+2815). The endogenous response equals 110, which is equal to the gender weighted average of the difference in the reduction in income to the wage reduction: ((1810*(968-831)+2815*(898-805))/(1810+2815). The numbers for Chapter 6 are based on new calculations.

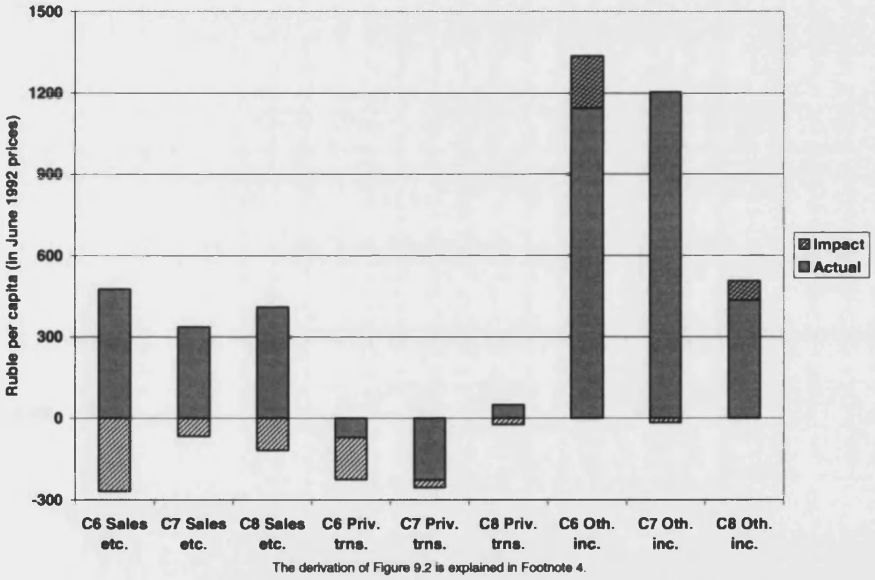
[3]In general, if the shaded area is above (above) the horizontal axis, then arrears led to a decrease (increase) in the outcome variable.

Figure 9.1: Income shock, endogenous response and other income in Chapter 6 to Chapter 8



The derivation of Figure 9.1 is explained in Footnote 2.

Figure 9.2: Household revenues and endogenous response in Chapter 6 to Chapter 8



The derivation of Figure 9.2 is explained in Footnote 4.

Accounting for the endogenous response, the net impact of the income shock was comparable in the three chapters both in absolute terms (around R700 to R800 per capita) and as a share of non-arrears income (around 30 percent).

Figure 9.2 separates the endogenous response into three types: sales, borrowing and unpaid bills; net private transfers; and other income before pensions (for pension arrears) or wages (for wage arrears).[4] The sum of the difference between actual and counterfactual for the three responses equals to the endogenous response of Figure 9.1. Sales, borrowing and unpaid bills was the most important response, and net private transfers the second most important response, in all three simulations. Pensioner households were also able to compensate about one sixth of the size of the pension loss through higher labour supply, but these gains were more than offset through losses in other income sources. By contrast, households were not able to take on additional jobs in response to wage arrears, most likely because of the depressed state of the labour market.

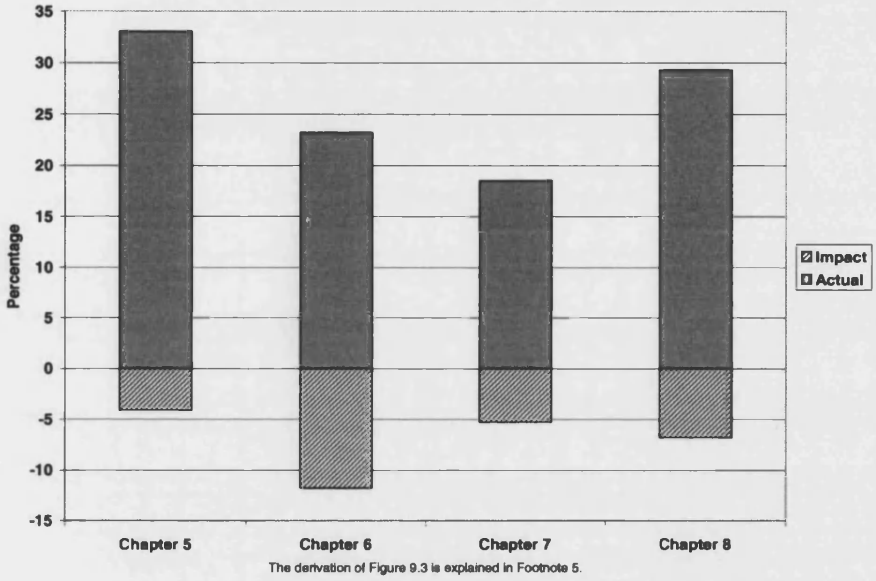
9.1.3 Poverty

Across the board, the payments crisis deteriorated poverty, nutrition and health outcomes. In general, the impact was worse for pension arrears than wage arrears, even though the income shocks after endogenous responses were comparable. This could suggest that these responses might have been costly in terms of reduced leisure, more stress, loss of assets or future commitments. In addition, the wage arrears crisis stretched over a number of years while the pension crisis unfolded suddenly, perhaps aiding households to anticipate better likely consequences of the non-payment of wages.

As a result of arrears, consumption poverty rose by 100 percent in pensioner households, by 40 percent in worker households with elderly and by 30 percent in worker households with children (Figure

[4]Figure 9.2 is based on tables 6.10, 7.10, and 8.5. For example, Column 'Chapter 7 Sales etc' has a height over zero of 335 Ruble per capita, which is equal to the gender weighted average of the level entries in the last row of Table 7.10: (1810*321+2815*344)/(1810+2815). The numbers for Chapter 6 are based on new calculations.

Figure 9.3: Consumption poverty in Chapter 5 to Chapter 8



9.3). Poverty increased by 15 percent nationwide due to changes in government cash transfers.[5]

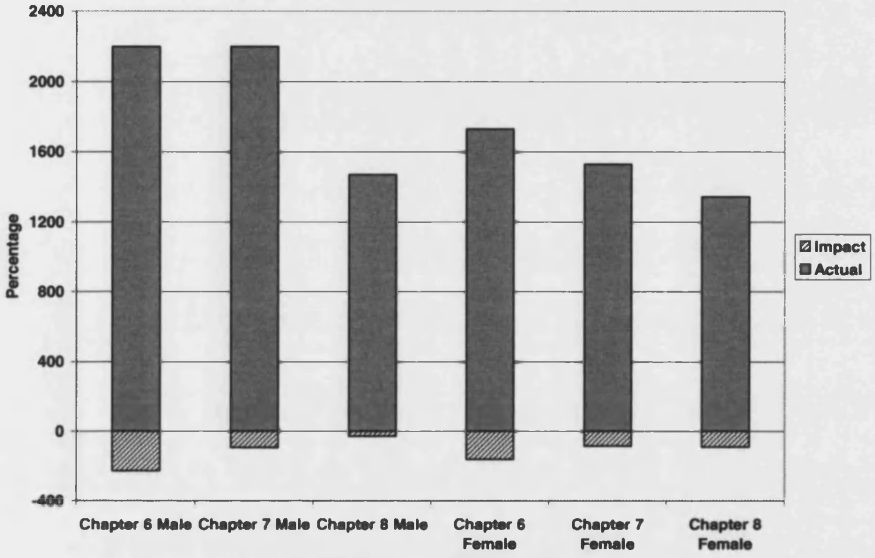
9.1.4 Nutrition

Compared to the drop of income and consumption and the rise in poverty, nutrition deteriorated more modestly (Figure 9.4).[6] This suggests that households reduced non-food expenditures and purchased cheaper calories. As for poverty, the impact of pension arrears on nutrition was larger than of wage arrears.

[5]With the exception of the Column 'Chapter 5', the numbers of Figure 9.3 are based on new calculations. 'Chapter 5' is based on the decomposition in Table 5.15 using propensities to consume of 0.89 for pensions and 0.34 for child benefits.

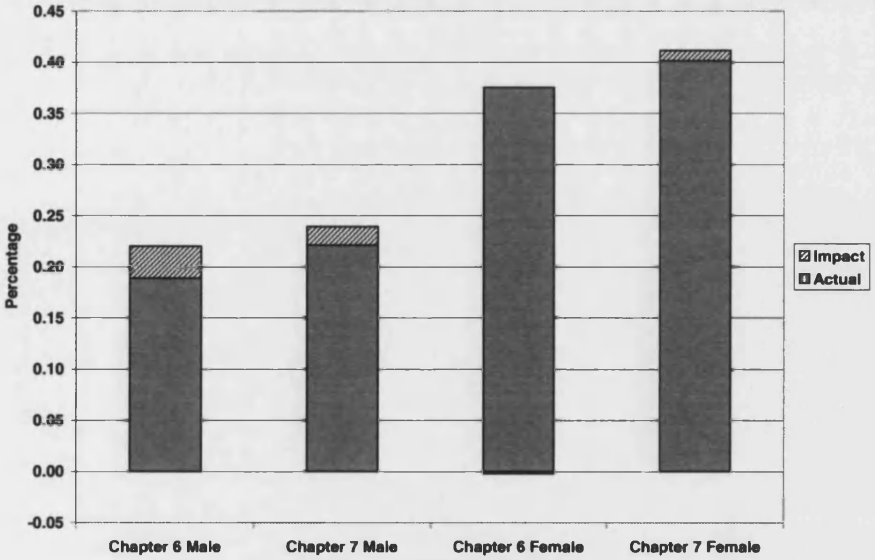
[6]Figure 9.4 is based on the first row of tables 6.8, 7.13, and 8.9.

Figure 9.4: Caloric intake in Chapter 6 to Chapter 8



The derivation of Figure 9.4 is explained in Footnote 6.

Figure 9.5: Function limitation in Chapter 6 and Chapter 7



The derivation of Figure 9.5 is explained in Footnote 7.

Figure 9.6: Mortality rate between survey rounds in Chapter 6 and Chapter 7

The derivation of Figure 9.6 is explained in Footnote 8.

9.1.5 Health

Pension and wage arrears worsened health outcomes of old age men but not (or only little) of old age women. The functional limitation score increased by 1.8 to 3.1 percent for men and 0 to 1 percent for women (Figure 9.5).[7] Mortality rates doubled for men and changed little for women (Figure 9.6).[8] The analysis does not pinpoint the reasons for the different effect on men and women. One possible explanation is health behaviour. Men's past and present drinking and smoking habits are dramatically more unhealthy, making their health status more vulnerable to economic shocks. The larger impact of wage arrears on men's health is consistent with the evidence on changes in the health of the Russian population during the 1990s. In line with the findings for poverty and nutrition, pension arrears worsened functional limitation and mortality more than wage arrears.

For children of up to 3 years of age, wage arrears increased stunting rates from around 8.7 percent to 14.3 percent (see Table 8.11).

9.1.6 Health service

Chapters 6 to 8 found little support for alternative explanations for the decline in welfare than the payment crisis, including other economic factors, the environment, physical activity and health service. For example, there was little change in health service utilization. Individuals with health problems in arrears households sought treatment about as often as individuals from non-arrears households (Figure 9.7),[9] and payment for treatment remained the exception also for persons from arrears households (Figure 9.8).[10]

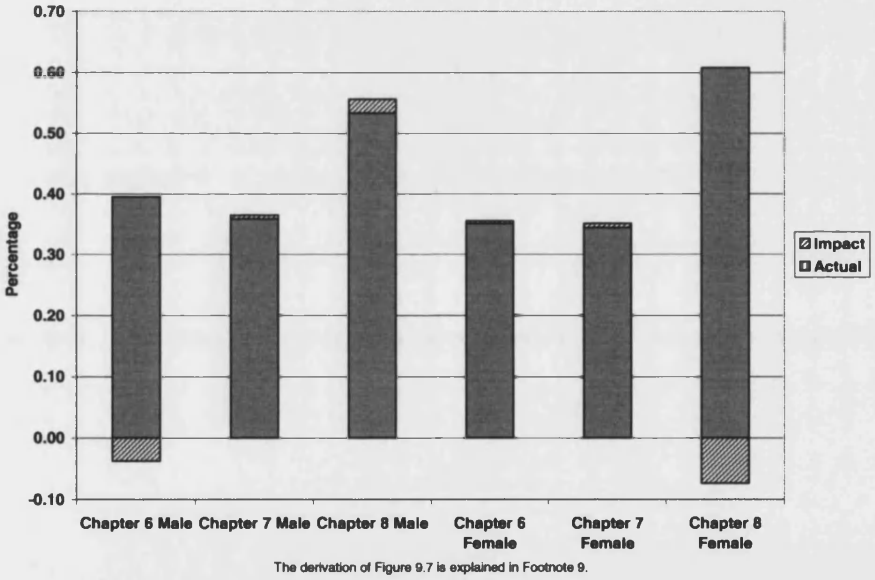
[7]Figure 9.5 is based on sixth row of Table 6.8 and the third row of Table 7.14.

[8]Figure 9.6 is based on first row of Table 6.9 and the last row of Table 7.14.

[9]Figure 9.7 is based on the third row of Table 7.11 and the second row of Table 8.6. The numbers for Chapter 6 are based on new calculations.

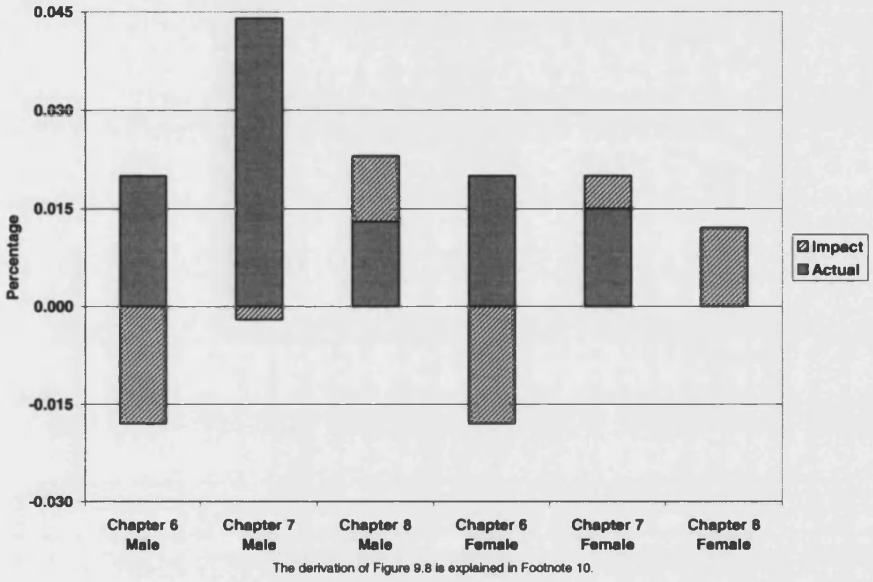
[10]Figure 9.8 is based on the fifth row of Table 7.11 and the fourth row of Table 8.6. The numbers for Chapter 6 are based on new calculations.

Figure 9.7: Treatment in response to health problems in Chapter 6 to Chapter 8



The derivation of Figure 9.7 is explained in Footnote 9.

Figure 9.8: Payment for treatment in Chapter 6 to Chapter 8



The derivation of Figure 9.8 is explained in Footnote 10.

9.2 Policy Lessons

A number of policy implications emerge from the thesis. First, government transfer and wage arrears are associated with large welfare costs for the recipients and their dependants. The first priority is to prevent such episodes from re-occurring. As emphasized in Chapter 4, the payment crisis was part of a wider arrears crisis involving transfer, wage, enterprise and tax arrears in both the public and private sector. While the payment problem would not have become so endemic without the difficult economic transition, it had direct fiscal origins related to a weak budgetary system where transfer entitlements and payment discipline were subject to political economy influences. The government promised increases in social entitlements based on unrealistic economic growth and budgetary revenue projections, only to impose later ad hoc sequestration and payment arrears. An accumulating public debt crowded out private investment through high interest rates, further lowering economic growth and tax revenues. The decentralization of the government sector resulted

in large differences in the provision of public services across states, compounding existing regional inequalities. This situation undermined the government's ability to respond effectively to the deterioration in living standards. The crisis came only to an end once economic growth gathered speed in the aftermath of a large marcoeconomic adjustment in the late 1990s. To avoid such scenarios in future, a stable macroeconomic environment and a transparent and efficient fiscal system are important. The challenge is to embed social policies in an macroeconomic and fiscal framework that enhances the realism of policy making. Social policy should reflect national priorities while taking into account resource and implementation realities over the medium term. In addition, the system of fiscal federalism has to ensure a match between revenue raising capacity and social needs in economically weak regions.

Second, another priority is to assist households in coping with changes in economic circumstances, including the transition phases of reforms in public transfer and pension systems. Providing education, improving access to productive resources and expanding markets all help people to reduce and mitigate exposure to risk. Furthermore, establishing clear and secure property rights and transparent rules for the purchase and sale and holding and use of assets will facilitate households' risk management. In addition, institutions which enable individuals to smooth consumption and self-insure, such as secure financial instruments, are valuable.[11]

Households may sometimes not be able to absorb a change in economic circumstances by themselves without large, and possibly permanent, welfare loss. The thesis presented evidence that house-

[11]Insurance schemes can be specifically designed to deal with the impact of a non-payment crisis. In South Korea, more than 15,000 firms went bankrupt during December 1997 to April 1998 and could not pay severance payment and wages to their employees (Phang and Kim 2001). To protect the livelihood of laid-off workers and their families, the government established the wage claim guarantee system. Under the system, workers forced to retire due to their employer's bankruptcy receive their wage arrears for their last three months of work and severance payment for the last three years from the fund in lieu of payment by the employer. The system was financed by a levy imposed on firms, which was 0.2 percent of total payroll in 1998, as well as a budget outlay of 190 billion won.

holds managed to compensate at most one quarter of the income shock, and suffered from worse nutrition and health, sometimes with irreversible consequences (mortality and stunting). Basic safety nets are required, especially for vulnerable groups. Such households include the elderly, as they may be too old or too sick to work, and, in the case of Russia, typically receive little help from their children. Similarly, families with young children deserve special attention, as nutritional and education deficiencies in the early stages of life can have lasting consequences. Temporary social schemes, like public works programs, may help in situations where a depressed labour market makes it impossible even for the working-age to earn wage income.

Large cash transfers such as pensions can also be an important component of the social safety net (Case and Deaton 1998). According to economic theory, cash transfers are always part of a first-best transfer scheme. Cash can be targeted directly to the desired beneficiaries, it allows recipients freedom of choice in their spending, and it avoids the losses that are associated with providing goods whose shadow value to the recipient is less than their cost to the provider. The distortionary effect of cash transfers on labour supply is likely to be insignificant in a context of under- and unemployment.[12] However, the experience in Russia and other countries has shown that cash transfers are often not viable for demographic and economic reasons, are difficult to administer, may not reach their intended beneficiaries, and may not be politically sustainable. To function effectively, they require strong political commitment and administrative capacity for book keeping, raising taxes, channelling funds and fighting corruption.

Third, even in the absence of income support and risk mitigation schemes, policies should aim to break the link from low income to

[12]In the context of famines, Dreze and Sen (1989) find that distributions of cash remedy the failure of entitlements and allow the market to deliver food efficiently in response to the appropriate price signals. The literature gives also a number of arguments for why non-cash transfers might be useful. Donors have preferences over the consumption pattern of the beneficiaries (Garfinkel 1973); in-kind transfers can correct other distortions (Guesnerie and Roberts 1984) or screen out undesirable recipients (Nichols and Zeckhauser 1982), as in food-for-work schemes.

poor diet. Nutritional programs, such as dietary counselling, breast feeding promotion and food fortification and supplementation can save lives, increase human capital, improve work productivity and reduce the burden on public health systems.

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