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Risk Insurance in a Transition Economy: Evidence from Rural Romania[1]

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Résumé

On teste l'hypothèse d'un partage des risques Pareto optimal dans une économie en transition en utilisant une base de données originale portent sur 364 ménages en Roumanie rurale. On identifie des chocs de revenus comme les mauvaises conditions climatiques, les problèmes liés au bétail ou aux récoltes, les maladies ayant affecté le foyer et les périodes de chômage. En dépit d'un taux de participation très limité des ménages Roumains aux systèmes de crédit et d'assurance, on ne peut pas rejeter l'hypothèse d'assurance complète de la consommation de biens non durables et de ses divers composants. Les enquêtes indiquent que le lissage de la consommation passe principalement par l'auto-assurance (pour les mauvaises conditions climatiques et les maladies liées au bétail), les transferts publics (pour le chômage) et par les liens familiaux. On trouve qu'un choc climatique adverse est associé à des taux supérieurs de dépenses non alimentaires. De plus, les ménages les plus riches sont les mieux à même de s'assurer contre les problèmes de récolte. Une explication alternative à ce non-rejet de l'hypothèse d'assurance complète est que certains chocs jouent le rôle de chocs de préférences dans la fonction d'utilité.

Mots clés: risque, assurance, lissage de la consommation, économie en transition

Abstract

We test the hypothesis of Pareto optimal risk-sharing in a transition economy using a new dataset on a representative sample of 364 rural households from Romania. We identify income shocks as instances of adverse weather, crop and animal diseases, as well as illness and unemployment spells. Despite limited participation of Romanian rural households in formal insurance and credit markets, we fail to reject the hypothesis of full insurance of total non-durable consumption and its components. Survey responses indicate that the main channels of consumption smoothing are self-insurance (for adverse weather, crop and animal diseases), public transfers (for unemployment spells), and to a lesser extent, family ties. We find that adverse weather is associated with higher growth rates of non-food expenditures. Furthermore, richer households are better able to cope with crop failure than poorer households. An alternative explanation to our not rejecting the hypothesis of full insurance is that some shocks to consumption (e.g., illness) play the role of preference shifters of the utility function.

Keywords: risk, insurance, consumption smoothing, transition economies.

JEL Classification: O12, O5, P2

I. Motivation

Development economists have extensively analyzed the households' ability to smooth consumption in face of adverse income shocks.[4] Transition economies, however, have generally not been the object of such studies (with the notable exception of Russia[5]), mainly because of data limitations. This paper aims at bringing new evidence to this literature. Using a unique dataset from rural areas in Romania, we determine whether Pareto optimal risk-sharing is achieved and we identify differences in households' ability to cope with income losses based on their characteristics.

We measure income variations at the household level with variables which quantify the occurrence and magnitude of income and consumption shocks such as adverse weather, crop failure and animal diseases, spells of illness and unemployment, maternity and nursery. The data enables us to circumvent an attenuation bias problem which typically arises in empirical tests of optimal risk-sharing due to measurement error in income or profits.[6] In the empirical specifications, we avoid this problem by measuring income variations *directly* with subjective shock indicator variables (e.g., the number of work-days lost due to an illness or unemployment spell).

Among transition economies, we choose Romania as our object of study because it has a large rural sector and has faced a particularly difficult period of transition marked by two economic crises. Forty percent of the country's labor force is employed in agriculture while the sector's contribution to total output during the 1990s has been of around one fifth (WDI, 2003). Romania has faced two severe economic recessions: between 1990 and 1992, its per capita GDP fell by 19 percent. After a short recovery, per capita income contracted again by 6 (1997), and 5 percent (1998). Only in 2003, after thirteen years of economic hardship, did the country's per capita output reach and even exceed its 1990 level (albeit by a mere 2 percent[7]).

Throughout the 1990s, public benefits have been an important source of formal insurance for Romanian households. Social protection transfers accounted for 3 percent of GDP in 1995.[8] In early 2002, the Romanian government implemented the Minimum Income Guarantee scheme which supplements the actual income of a family to meet a minimum level. Sahn et al. (2000) document the crucial role played by government transfers in helping poorer households cope with increased vulnerability during the difficult times of transition.

[4] For a description of main issues on this subject, see Alderman and Paxson (1994), Townsend (1995) and Morduch (1995).
[5] Russian households have been analyzed in papers such as Skoufias (2003), Stillman (2001), Mu (2003), Notten (2004) and Guariglia and Kim (2003, 2004). We discuss this literature in detail in Section II.
[6] For a detailed discussion on the subject, see Deaton (1997). Skoufias (2003) documents the extent to which measurement and imputation errors in income and consumption are responsible for misleading Ordinary Least Squares estimates of the relevant parameters in a sample of Russian households, and implements an instrumental variables strategy whereby directly measured shock variables are used to isolate exogenous variation in income.
[7] Based on per capita income in constant local currency units (WDI, 2003)
[8] Source: UN Statistics Division (1995).

Rural Romania is an interesting setting for this kind of analysis also because rural households have been particularly credit constrained throughout the 1990s. Using the 1998 Surveys of Rural Households and Enterprises, Chaves et al. (2001) show that only 20 percent of rural households borrowed in the market for cash loans in 1998. As little as 1.1 percent of rural households borrowed from formal lenders (private and state banks) while 10.1 percent used semi-formal lenders (e.g., credit cooperatives).

This analysis, although focusing on the Romanian case, is relevant to a larger set of transition countries, including Moldova, Albania, Bulgaria and Ukraine, as these countries share an underlying specificity of the rural sector: significant contribution to employment[9], implementation of legislative changes including land reforms aimed at enabling the transition from state ownership to private ownership of agricultural land, and high land fragmentation. This study aims at providing evidence on the ability of rural households to smooth their consumption, which is a critical input in policy-making (e.g. in the design of social safety-net programs). Such evidence is also relevant in the context of high poverty levels in transition countries.[10]

In our data, we find no evidence against a Pareto-efficient allocation of consumption when Romanian rural households are faced with shocks to their income stream. This, however, does not necessarily imply that the efficient outcome is achieved; the empirical results may be confounded by the role played by some types of shocks (e.g., illness) as preference shifters of the utility of consumption. We also find that poorer households are less able to cope with shocks (e.g., crop failure and bad weather) than richer households. Finally, the occurrence of adverse weather is positively correlated with the growth rate in non-food consumption.

The remainder of the paper is organized as follows. In Section II we review the literature; Section III discusses the data and descriptive statistics; Section IV presents the econometric strategy and the variables used in the regressions. The main empirical findings are outlined in Section V and we conclude in Section VI.

II. Previous work

The foundations of the theoretical framework for Pareto optimal risk-sharing were laid by Cochrane (1991), Mace (1991) and Townsend (1994). Most of the existing empirical literature focuses on developing countries, with the exception of Mace (1991), who tests

[9] In Moldova, roughly 50 percent of the labor force is employed in agriculture. Like in Albania, the sector contributes about a quarter of GDP. Bulgaria's agricultural sector contributes slightly less than Romania's to the country's GDP (12 percent in 2002-3) and employs a quarter of the labor force, while Ukraine's is about 15 percent of total income and employs one fifth of the labor force (2001). (Source: WDI, 2003.)

[10] The World Bank estimates that Romania's poverty headcount – for the $2.15 per day international poverty line (at 1993 PPP) – was 28 percent in 1994. It was as high as 74 percent in Moldova in 1999 while in Ukraine it continuously increased throughout the 1990s up to 31 percent (1999). In 1996, one person in five had a consumption level lower than $2.15 per day in developing Europe and Central Asia. (Source: WDI, 2003.)

the full insurance hypothesis in the United States, using a wide range of utility functions.[11] The literature on developing countries brought a large body of evidence that households' consumption is remarkably smooth while their income is subject to large variations.[12] Using data on households from rural China, Jalan and Ravallion (1999) show, however, that households are partially insured regardless of wealth level, however the hypothesis of perfect risk insurance is universally rejected in their sample.

The insurance networks investigated by the authors vary greatly. Deaton (1992) and Jalan and Ravallion (1999) take the village as their unit of analysis, while Morduch (1990) concentrates on the role of caste ties in mutual insurance. Grimard (1997) draws on the anthropological literature to investigate whether households in Cote d'Ivoire take part in spatially diversified risk-sharing arrangements with members of their own ethnic group. Similarly, Fafchamps and Lund (2003) show that mutual insurance does not appear to take place at the village level but rather that households receive help primarily through networks of friends and relatives. Furthermore, Rosenzweig and Stark (1989) argue that households may try to diversify their kinship ties spatially, for instance by sending their daughters as brides in other villages, in order to mitigate the effects of the locally covariant nature of the risks they face. Recently, Munshi and Rozsenzweig (2005) have shown that economic development in India has brought about a decline in the role of traditional networks (based on caste ties) in acting as social insurance safety nets. In particular, the authors state that rising incomes and better opportunities have led the wealthiest members of traditional networks to exit those networks, which in turn led to the poorest members to be worse off due to the reduced ability of the networks to provide insurance when they faced adverse income shocks.

In order to capture idiosyncratic shocks to income, Grimard (1997) and Jalan and Ravallion (1999) use variations in total household-level income, while Townsend (1994) looks at the impact of certain income components on the growth rates of consumption, thus allowing the elasticity of consumption with respect to income to differ across income sources. In specifications identifying the effects of income and consumption shocks on coping behaviors of Philippine rural households, Fafschamps and Lund (2003) use directly-measured, subjective shock variables instead of changes in income as regressors. This strategy is also employed by Skoufias (2003) in a sensitivity test of the effect of income fluctuations on the growth rate of consumption in a sample of Russian households.[13] As in our paper, this strategy achieves two goals: first it avoids a potential

[11] For example, Dubois (2001) allows for heterogeneity in risk aversion and uses an isoelastic utility function (in the class of CRRA functions) to model preferences of households in Pakistan to show that those involved in sharecropping contracts better insure their consumption against risk. Zhang and Ogaki (2001) use a hyperbolic relative risk aversion utility function and find evidence supporting the decreasing relative risk aversion hypothesis in the ICRISAT data from rural India, failing to reject full risk insurance at the village level but rejecting it at the inter-village level.

[12] See, for example, Townsend (1994), Chaudhuri and Paxson (2001) and Morduch (2001) for India, Paxson (1993) for Thailand, Jacoby and Skoufias (1997) for Bangladesh, Ethiopia, Mali, Mexico and Russia, Fafchamps and Lund (2003) for the Philippines, Deaton (1992) and Grimard (1997) for Cote d'Ivoire, and Dubois (2000) for Pakistan.

[13] Some of the shocks in Fafchamps and Lund (2003) are: crop failure, unemployment, sickness spells, and funerals. Skoufias (2003) uses dummies for unemployment spells and wage arrears as income shock proxies.

endogeneity problem caused by measurement error in the income variable and imputation error in the consumption variable. Second, the directly-measured shocks serve as proxies for sudden changes in both income and consumption.

The typical empirical model used for tests of full insurance usually estimates an ‘excess sensitivity parameter’, namely the elasticity of per capita consumption with respect to idiosyncratic income shocks. Townsend (1994) uses the difference between the individual and the group average consumption as the dependent variable. Other studies use the methodology proposed by Ravallion and Chaudhuri (1997) and include time-group dummies as explanatory variables in order to control for the aggregate component of income variations, thus allowing the income variable to only capture idiosyncrasies (Grimard 1997, Jalan and Ravallion, 1999, and Skoufias, 2003). We do recognize, however, that a major limitation of the testing strategy is the fact that the test itself provides little guidance on what explains its results and which are the real insurance groups and post-shock coping mechanisms that work in achieving (partial or full) insurance.

Several studies focus on the consumption behavior and coping strategies of households in transition economies. Skoufias (2003) and Notten (2004) assess the ability of Russian households to smooth consumption using multiple rounds of the Russian Longitudinal Monitoring Survey (RLMS) for selected years before and after the 1998 financial crisis. Skoufias (2003) finds that Russian households’ consumption is only partially protected against income fluctuations. Some of the coping strategies of households are: adjusting non-food consumption to protect food consumption, borrowing, adjusting labor supply, and selling assets The author also assesses the vulnerability of Russian households to income shocks based on their observable characteristics, and finds that poorer and urban households face a *higher* level of co-variation between their income and consumption changes than wealthier and rural households, respectively. Notten (2004) uses an additional round of the RLMS and a dynamic variant of Skoufias’ model to confirm that the hypothesis of Pareto efficient risk sharing is rejected in the full sample, however urban households are more vulnerable than rural households in face of income shocks.

In two related studies of Russian households’ self-insurance behaviors during the 1990s, Guariglia and Kim (2003, 2004) focus on the role of specific mechanisms such as precautionary savings and moonlighting in achieving consumption smoothing. In their earlier article, the authors document a strong precautionary reason for saving by households that face earnings uncertainty (proxied by the probability of suffering wage arrears). Their second study finds that the precautionary savings hypothesis is also supported in sub-samples of households in which the head holds only one job. However, when the household head holds two jobs, households no longer save in light of earnings uncertainty (proxied by the probability of primary job loss). In that case, the alternative self-insurance mechanism appears to be moonlighting.

Using selected years of the RLMS, Mu (2003) investigates the differential effect of education on the ability of Russian households to smooth consumption. The author stratifies the data by non-financial asset value and uses information on shocks to isolate the exogenous variation in income. The predicted income variable is subsequently interacted with household head's education level with the aim of allowing for differential effects in households' abilit to smooth consumption. The author finds an education effect on consumption smoothing for high asset households but not for low asset households, and rejects the null hypothesis of full insurance in the full sample of households.

III. Data and summary statistics

We use data collected from two waves of a survey on a representative sample of 364 Romanian households from rural areas. Interviews with households from 40 villages in 21 counties were conducted at the end of 2003 and 2004 (for a description of the survey methodology, see the Appendix). Although data was collected for a wealth of variables[14], in this paper we use the information on household characteristics, total non-durable consumption and its components[15], and incidence and magnitude of income shock. Self-produced food is valued at mean prices for different categories of foodstuffs in the county of residence. [16] Table 1 in the Appendix summarizes the main household characteristics.[17] The average rural household in the survey has the following consumption structure: approximately one half of total non-durable consumption is self-produced, almost thirty percent represents food spending, and the remainder represents non-food expenditures.

Detailed information was collected on instances of adverse weather[18], crop failure, and animal diseases.[19] Furthermore, questions were asked about the number of work-days lost because of illness, unemployment spells, maternity, nursery and other events such as funerals and weddings. Tables 2 and 3 in the Appendix present descriptive statistics for the subjective income shocks. Half of the households interviewed in 2003 and 14 percent of households in the next year reported adverse weather for agricultural production. Almost one third of all households received some form of help or undertook activities to cope with the income shock (e.g., sales of previous cereal stock, animals and agricultural equipment). *None* of the households reported having received formal insurance or taken loans prior or after the occurrence of the income shocks, in either year. Crop failure

[14] These include household characteristics, consumption, income, informal transactions, informal borrowing and lending, as well as data on participation in formal insurance and credit/savings markets.
[15] Food, non-food and self-produced (food) consumption were reported using the traditional 30 day recall period. No changes were implemented in the data collection methodology between the two surveys, in order to ensure comparability across the two years (2003 and 2004).
[16] The households reported quantities for the following consumption foodstuffs: cereals, vegetables, fruit, potatoes, alcohol, milk, meat, and eggs. The source of average county-level foodstuffs prices is the Bursa Agricola supplement to the Bursa newspaper, dated January 16 2004 and January 16 2005. Since the imputed value is based on market prices collected in several marketplaces in each household's county, this is most likely an overestimate of the 'true' value of self-produced food.
[17] A comparison of our sample summary statistics with those from the dataset used by Amelia et al (2004) and those from the Family Budget Surveys (National Institute of Statistics, 2004) is available from the authors upon request.
[18] Including: drought, fire, flood, and sleet.
[19] For example, the household head was asked about the amount of income lost in the case of each shock, whether help was received from any source, the source of help, and the sum in ROL received as help.

affected about 12 percent of households in 2003 and 7 percent of households in 2004. Again, the main mechanism for smoothing consumption in the case of crop failure (and animal diseases, which however affected fewer households) appears to have been some form of self-insurance.

Sixteen percent of survey respondents reported that one household member was afflicted with an illness spell in 2003 (the corresponding figure in 2004 was 12 percent). Unemployment spells were only experienced by household members in 2 percent of households in each year. It is noteworthy, however, that these and other events which would tighten a household's budget constraint - although fewer in number – were "insured" by a larger percentage of households. For example, between 60 and 76 percent of households received monetary help during unemployment spells, maternity or nursery. In these cases, post-shock help primarily arrived from relatives or from employers (as unemployment benefits or maternity/nursery paid leave). The sources of help in cases of illness spells were most diverse: households either resorted to self-insurance activities, or received help from relatives, neighbors, and employers (public transfers).

The dataset reveals a reduced degree of participation in formal insurance and credit/loan markets by rural households in Romania. In 2004, 17 percent of all interviewed households made a loan application (slightly fewer than in 2003), and the same share of households had a contract with an insurance firm in either year. Insurance contracts, however, were primarily sought for work accidents and life (approximately one quarter of "insured" households), illness (~10 percent) and loss/theft of property (less than 10 percent).[20] In 2003, only one household had an insurance contract against loss of income from crop failure and two households held such a contract in 2004.[21]

Table 4 presents partial correlation coefficients between growth rates of different components of consumption (food, non-food, self-produced, and total non-durable) and changes in the indicator variables capturing income shocks. The positive correlation coefficient between the change in the adverse weather dummy and changes in non-food expenditure is the only statistically significant estimate, suggesting possible coping mechanisms employed by households in the wake of bad weather: for example, increased demand for construction materials and damage repair. The lack of statistical significance of the other partial correlation coefficients in the table, shows that growth rates of consumption are (unconditionally) uncorrelated with changes in income as proxied by the shock indicators and shock magnitude variables. We proceed next to test whether these preliminary results are reinforced by regression analysis.

[20] Car insurance is mandatory and was reported to be held by almost three quarters of all interviewed respondents.

[21] Similarly, in each year, only one household had an insurance contract against loss of property from fire.

IV. Econometric strategy

In this section, we discuss the econometric specification yielded by the social planner's problem of utility maximization of a risk-sharing community (for details, see Bardhan and Udry (1999)). For reasons of tractability of the testable implications, we assume that the utility of consumption is of CRRA type and is the same for all community members.[22] We also assume that community members have the same rates of time preference, and preferences are separable across time and states, and between leisure and consumption.[23] We allow the marginal utility of consumption to be affected by some shocks (e.g., illness) and specify the following functional form:

$$U(c_{ijt}, S_{ijt}) = \frac{1}{1-\psi} c_{ijt}^{1-\psi} S_{ijt}^{-\theta}$$

where the variable S increases with the amplitude of the shock and is re-scaled in such a way the S equals one when there is no shock. (ψ is the inverse of the elasticity of substitution, θ is the preference shifter; $i = 1,...,N$ indexes the households, $j = 1,...,J$ indexes communities, and $t = 1,...,T$ is the time index).

The first order condition to the Pareto program for testing the hypothesis of full risk insurance results in the following econometric specification (proposed, for example, by Ravallion and Chaudhuri (1997)):

$$\Delta \ln(c_{ijt}) = \sum_{l,k} \delta_{l,k} D_{l,k} + \theta \Delta \ln(S_{ijt}) + \varepsilon_{ijt} \tag{1}$$

where the first term on the right-hand side of the equation is a summation of time-community dummies; the dummies are defined such that $D_{l,k} = 1$ when $l = j$ and $k = t$. The time-community dummies are meant to capture changes in the resource constraints faced by the community at different times. They are a proxy for the aggregate, community-level shocks to income, i.e., the component of risk against which the household cannot insure. We focus on the specification which directly follows from (1):

$$\Delta \ln(c_{ijt}) = \sum_{l,k} \delta_{l,k} D_{l,k} + \sum_{m} \gamma_m \Delta \ln(S_{m,ijt}) + \varepsilon_{ijt} \tag{2}$$

where ΔS_{mijt} represents the change in the m^{th} idiosyncratic shock variable, and $\{\gamma_m\}_{m=1,...,M}$ is the set of excess sensitivity parameters. Notably, θ is *not* an excess sensitivity

[22] A CARA utility function leads to similar testable implications, except that the variables are in levels.
[23] Townsend (1994) allows for non-separability of consumption and labor, controlling for village-level labor. Furthermore, Mace (1991) shows that the first order conditions implied by a power utility function which is non-separable across consumption goods are consistent with the testable implications of the single-good case.

parameter; instead, the term ΔS_{ijt} needs to be controlled for in the regression as it represents changes in preferences.

From equation (2), it is apparent that we face an inescapable problem of identification: specifically, we cannot separately identify the excess sensitivity parameters $\{\gamma_m\}_{m=1,...,M}$ from the preference shifter θ for those shocks which indeed affect the marginal utility of consumption.[24] A positive and significant coefficient on the change in illness shocks may either be interpreted as shifts in preferences (which intuitively means that when one faces a health shock, one needs to consume more in order to achieve the same utility level) or as over-insurance (i.e., an illness spell leads to an increase in the consumption growth rate when the individual receives an amount of help in excess of her growth rate of consumption, conditional on her characteristics).

Assuming θ equals zero, equation (2) lends us a test for Pareto optimal risk-sharing. First, we run an F-test of joint significance on all dummy coefficients. If we rejected the null hypothesis that the dummies did not matter, then we would conclude that households' consumption responds to the resource constraint of the community to which they belong. Second, we run F-tests of joint significance of coefficients on changes in income shocks. Rejecting the null hypothesis in these tests would indicate that household consumption growth rates co-move with idiosyncratic changes to income, which is evidence against the hypothesis of perfect risk-sharing.

We consider four dependent variables: expenditures on food items, expenditures on non-food items, the imputed value of self-produced food consumption, and total non-durable consumption (the sum of the three components).[25] The set of income shocks includes adverse weather (dummy variable taking value 1 if adverse weather was reported), crop diseases (dummy variable taking value 1 if a crop disease was reported), animal diseases (dummy variable taking value 1 if an animal disease was reported), illness (number of labor days lost because of illness) and unemployment (number of days spent in unemployment).[26]

In all specifications we control for potential preference shifters with two household composition variables: the number of newborns in 2004 and the change in the number of children less than 14 years of age living in the household. We present both Ordinary Least Squares (OLS) estimates and Two Stage Least Squares (2SLS estimates), as we allow the household composition variables to be endogenous. Following the practice in the literature, we use several instruments for the household composition variables: the age of the survey respondent, age squared, her experience in agriculture (number of

[24] Naturally, there may exist not only for one, but a series of preference shifters, each accompanied by a different θ coefficient; however, in the discussion we refer to only one such coefficient for simplicity.
[25] The consumption data is expressed in adult equivalent terms using an adjusted number of household members based on the formula $n^{\theta} = (A + 0.5B)^{0.9}$ where A = number of adults and B = number of children (Katsu et al, 2003).
[26] We do not include variables for maternity and nursery in the regressions since too few such instances are reported to obtain meaningful results.

years), her education level (number of schooling years), and the lagged number of household members.[27]

V. Empirical findings

Regression results are reported in Tables 5 to 7. First, we note that the F-tests on the village-dummy coefficients all lead to a rejection of the null hypothesis that aggregate shocks do not matter. Furthermore, there is clear evidence that the coefficients on the shock variables are insignificantly different from zero. This is the case in all regressions presented in the paper. We therefore conclude that per capita consumption co-moves with the aggregate resource constraints while income variations proxied by shock indicator variables and 'magnitude' variables, are not systematically correlated (as a group) with consumption growth rates for different consumption components.

In Table 5, one notable exception is the statistically significant coefficient on the weather shock dummy in the case of non-food consumption. In particular, the coefficient estimate indicates that households in regions afflicted by adverse weather experienced increases in non-food consumption between 55 and 75 percent higher than those which did not. No other income shock appears to be correlated with the growth rate of total non-durable consumption or its components.[28]

In order to determine whether the conclusions drawn from the previous table hold for poorer and richer households alike, we test a second empirical model. Whether insurance schemes are less efficient for poorer households has been investigated, for example, by Jalan and Ravallion (1999). While poor households are likely to have a high notional demand for insurance, they are also likely to be more rationed in access to formal credit and insurance. To test whether their consumption is more vulnerable to income shocks, we split the sample into rich versus poor households based on total per capita non-durable consumption, and construct an indicator variable for those households whose per capita non-durable consumption is twice higher than the sample median in the pooled dataset.[29] We then include in the regressions interaction terms between this 'rich household' dummy and changes in shocks to income. The results are reported in Table 6.

[27] In the first set of regressions, to assess the relevance of instruments, we report the p-value of the F-test for joint significance of all instruments for each endogenous variable. We also report the p-value of the Hansen J test for identification of instruments. These statistics are not shown in subsequent regressions for space reasons.

[28] Furthermore, our findings are robust to alternative measures of the shocks, e.g. an illness shock dummy instead of the number of days of the illness spell, and an unemployment shock dummy (for shocks longer than 60 days) instead of the number of days of the unemployment spell. The results are available from the authors upon request.

[29] Alternative definitions of a 'rich' household dummy led to similar results. For example, we experimented with splitting the sample in richer households which have per capita total-non durable consumption higher than the median for each year, or the higher median of the two years. Since the definition of 'rich' was less stringent, the results were weaker (and are not presented here).

Overall, there is no evidence that richer households better insure food consumption than poorer households. However, after crop failures, richer households' growth rates of non-food consumption, self-produced consumption and total non-durable consumption are higher than those of poorer households. Illness spells also correlate with growth rates of non-food consumption and are higher by almost 3 percent relative to poor households. The latter may reflect either the preference shifting role of illness shocks or the rich households' ability to better cope with expenditures on medical treatment.

We explore one last empirical model whereby we allow households which reported having received post-shock help and indicated the sum received as help, to systematically have lower excess sensitivity parameters than households which received little or no help. In particular, we include interaction terms between the amount received after each shock and the shock variables. The results are presented in Table 7. The coefficient estimates on the interaction terms are positive and significant in the OLS specifications for the crop failure shock in the case of food spending and non-food spending. These could indicate that households which received more money better insured their food expenditures than those which did not report having received monetary help. However, caution is called for in interpreting this result, since the amount received as help could be endogenous to 'anticipated' changes in consumption.

The significance of the insurance-group dummies in all the empirical specifications suggests that consumption responds to movements in the resource constraint of the villages. We note, however, that one can not determine - based on these results - the exact insurance group, the extent of insurance achieved within each group or that achieved for each income shock. While the F-tests on the potential insurance group dummy coefficients indicate that aggregate shocks do matter, this econometric specification (equation 2) does not permit an assessment of the strength of the co-movement between the growth rate of per capita consumption and the growth rate of consumption of the 'true' insurance group.

VI. Discussion and conclusions

In this paper, we have tested the hypothesis of Pareto-optimal risk-haring in rural areas from a transition economy (Romania), using survey data collected for 2003 and 2004 on a representative sample of 364 rural households. We are motivated to investigate the issue of insurance in rural communities due to the specificity of the rural sector in transitional economies, the sharp economic contraction experienced by most countries in transition throughout the 1990s, and the limited participation rates of rural households in formal credit and insurance markets. We use a new and rich dataset which enabled us to avoid the standard econometric problems posed by measurement error in income. More specifically, we identify income shocks with dummy variables representing instances of adverse weather, crop and animal diseases, as well as 'magnitude' variables indicating the number of work-days lost due to spells of illness and unemployment. In the econometric specifications, we include preference shifters such as changes in household composition, which we allow to be endogenous.

We fail to reject the null hypothesis of full insurance. In our sample, households experience a positive, statistically significant increase in the growth rate of consumption of non-food items in the wake of adverse weather. There is some evidence that richer households better cope with crop failure than poorer households. Furthermore, households which report having received help after crop failures appear to have better insured against this income shock than those which did not receive any help; nevertheless, endogeneity of the amount of help received may be a concern. Tabulations from survey responses suggest that consumption smoothing is achieved primarily through three channels: self-insurance (in the case of bad weather, crop and animal diseases), public transfers (in the case of unemployment, maternity and nursery) and, to a lesser extent, family ties. Some caution is however needed in concluding that Pareto optimal risk-sharing is achieved in Romanian villages since some income shocks (e.g., illness) may themselves play the role of preference shifters.

We note that the conclusions of this study are aligned to those of previous analyses of Russian households' ability to smooth consumption during the 1990s (Skoufias 2003, Notten 2004). Skoufias (2003) found that rural household consumption in Russia between 1994-2000 was *fully* insured from idiosyncratic income fluctuations, while Notten (2004) concluded that it was urban households that were more vulnerable to income shocks (despite lower poverty rates) during the same period. These findings are remarkable in light of the fact that the incidence of wage arrears was higher for Russian households in rural areas than for those in urban areas and was positively correlated with consumption poverty rates (Desai and Idson, 1998). All studies on consumption smoothing in Russia (including Mu, 2003), found that in samples comprising both rural and urban households, full risk sharing is rejected. It is thus concluded that Russian households were only partially able to insure their consumption streams during the 1990s.

To our knowledge, there are no studies of Romanian household consumption during the 1990s to enable a direct comparison with findings for Russia. Our analysis is concerned with the years 2003 and 2004, a time when the Romanian economy had well recovered from the two crises in 1992/3 and 1997/8. Lokshin and Ravallion (2000) document the welfare impact of the 1998 financial crisis in Russia, a covariate shock which brought about further increases in wage arrears, pension arrears, and consumption poverty. During the period when we collected our data, wage arrears in Romania accounted for 12 percent of total arrears (June 2003), a "relatively low number among transition countries" (IMF Country Report No. 04/220, 2004, p. 7). While the two countries share relatively similar rates of consumption poverty at the time of our survey (in 2002/3, the $1/day and $2/day poverty headcount ratios were 2 and 13 percent, respectively), Russia's poverty rate was starkly higher than Romania's during the 1998 crisis (and in subsequent years).[30]

[30] The average poverty headcount ratio in 1998 was 35.6 percent in Russia and 12.2 percent in Romania (based on the $2/day poverty line). (Based on authors' calculations using the World Bank's POVCALNET with default PPPs.)

These facts may provide some guidance as to why we fail to reject full insurance in our sample while studies on Russian households find evidence of *partial* insurance only.

While our conclusions are somewhat optimistic, we believe that future research should focus on identifying those shocks which *increase* the vulnerability of rural households. Furthermore, analyzing shock-specific coping mechanisms would be of use in the design of social safety net programs aiming at protecting the livelihood of rural households in transition economies.

VII. References

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VIII. Appendix

Sample and Survey methodology

The interviews were conducted and the questionnaires were filled out by field interviewers during “face-to-face” sessions with household members. Field support was provided by the Gallup Organization in Romania. The household sample has the following characteristics:

- *Sample size*: 364 households, exclusively from rural areas
- *Sample type*: stratified, probabilistic, two-stage sample.
- *Stratification criteria*: degree of development of rural localities (3 categories) and 8 geographic areas based on historical regions, (Muntenia, Oltenia, Banat, Crishana-Maramuresh, Transylvania, Moldova, Dobrudgea and Bucharest).
- *Sampling*: probabilistic selection of localities (40 rural), sample units (streets) and households. Households were selected using the random route method.
- *Representativity*: the sample is representative for the rural Romanian household population, with a maximum sampling error of 4.5 percent.
- Data was not weighted.

Table 1. Summary statistics: household characteristics and monthly consumption[31] (364 households)

Variable	Mean	Std. Dev.	Mean	Std. Dev.
Year	**2003**		**2004**	
# of household members	4.07	1.47	3.89	1.55
# of children[32]	0.89	1.07	0.73	1.18
Age of survey respondent	48.09	14.39	51.22	14.34
Education of respondent (# yrs schooling)	10.16	3.19	9.75	3.17
Agricultural experience of respondent (# yrs)	22.96	17.25	25.52	17.00
Food expenditure	2.23	1.43	2.21	1.55
Non-food expenditure	1.47	1.48	1.40	2.55
Value self-produced food	3.58	2.24	4.66	4.09
Total non-durable consumption	7.29	3.96	8.28	5.75

Table 2. Summary statistics: directly measured (subjective) income shocks

Shock	Number of cases	Households affected	Number of days	Households received help (%)	Number of cases	Households affected	Number of days	Households received help (%)
			2003				**2004**	
Adverse weather	181	50%	-	22	51	14%	-	29
Crop diseases	44	12%	-	14	24	7%	-	21
Animal diseases	40	11%	-	15	18	5%	-	2
Illness	57	16%	85	39	45	12%	57	5
Unemployment	9	2%	48	56	8	2%	104	8
Maternity	6	2%	212	50	7	2%	106	6
Nursery	7	2%	257	57	1	0%	120	1
Others	8	2%	-	50	7	2%	-	57

[31] Expressed in 2003 Million ROL.
[32] This is the number of children under 14 living in the household.

Table 3. Summary statistics for sources of help and amounts received post-shock (pooled dataset) [33]

Shocks	Self-insured[34]	Neighbors	Relatives	Govern-ment Benefits	Formal insurance or credit	Other	% hh reported help
	[1]	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	
Adverse weather							
% hh	17.2	0.0	2.6	8.6	0.0	1.7	**30.1**
Mean sum	5.5		1.9	2.7		10.0	
Crop diseases							
% hh	10.3	2.9	0.0	1.5	0.0	1.5	**16.2**
Mean sum	3.0	-		-		1.0	
Animal diseases							
% hh	8.6	0.0	3.4	0.0	0.0	1.7	**13.7**
Mean sum	8.0		1.0			7.0	
Illness							
% hh	6.9	1.0	6.9	6.9	2.9	5.9	**30.5**
Mean sum	1.1	0.2	2.6	7.6	2.1	4.6	
Unemployment							
% hh	5.9	0.0	11.8	41.2	0.0	17.6	**76.5**
Mean sum	4.9		-	5.35		10.8	
Maternity							
% hh	0.0	0.0	0.0	46.2	0.0	15.4	**61.6**
Mean sum				13.9		-	
Nursery							
% hh	0.0	12.5	12.5	37.5	0.0	12.5	**75.0**
Mean sum		24.0	0.2	3.4		-	

Note: All figures are computed as a percentage of households that reported an income shock. The difference up to 100 percent is represented by households which reported an income shock but did not report whether they received help or not.

[33] Expressed in 2003 million ROL (per month for illness, unemployment, maternity and nursery; lump sum for adverse weather, crop failure and animal diseases).
[34] The following activities are considered to be self-insuring: sales of livestock, sales of cereals from the stock, sales of equipment and tools, usage of savings, cash and jewelry, and asking children to work more on the farm.

Table 4. Partial correlation matrix between changes in consumption and regressors.

	Δ food consumption	Δ non-food consumption	Δ self- produced food consumption	Δ total non-durable consumption
Δ Adverse weather dummy	0.068 [0.212]	0.163* [0.004]	0.054 [0.298]	0.088 [0.098]
Δ Crop diseases dummy	0.094 [0.081]	0.032 [0.568]	0.073 [0.170]	0.086 [0.107]
Δ Animal diseases dummy	-0.022 [0.690]	-0.025 [0.656]	-0.033 [0.567]	-0.043 [0.461]
Δ Illness shock - # days	0.005 [0.925]	-0.001 [0.985]	0.038 [0.513]	0.017 [0.761]
Δ Unemployment shock - # days	-0.022 [0.682]	0.027 [0.640]	-0.025 [0.660]	-0.016 [0.777]
# of newborns	-0.052 [0.342]	-0.083 [0.144]	-0.102* [0.056]	-0.079 [0.134]
Δ # of children under 14	0.042 [0.436]	-0.032 [0.577]	0.049 [0.397]	0.028 [0.632]

Note #1:* represents significance at the 5%. Standard errors of the partial correlation coeffcients are reported in brackets.

Note #2. In the regressions, the number of observations may change between regressions since the # of available datapoints for different information sets changes (missing responses). In order to preserve as much of the information we have from the dataset, we choose not to restrict the regressions to the households for which we have full data on all the variables.

Table 5. Village level regressions

	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Dependent variable →	Δ Food Consumption		Δ Non-Food Consumption		Δ Self Produced Food Consumption		Δ Total non-durable consumption	
Δ Adverse weather dummy	0.0005	0.1142	0.5544***	0.7591*	0.0955	0.1203	0.1604	0.2343
	[0.1578]	[0.2192]	[0.1775]	[0.4133]	[0.1834]	[0.2689]	[0.1593]	[0.2638]
Δ Crop diseases dummy	-0.0746	0.2589	-0.4656	0.0693	-0.1716	0.2338	-0.1818	0.2263
	[0.2460]	[0.3035]	[0.3424]	[0.5070]	[0.2778]	[0.3548]	[0.2539]	[0.3315]
Δ Animal diseases dummy	-0.2051	-0.0005	-0.1481	0.3319	-0.2127	0.0561	-0.2037	-0.0023
	[0.1747]	[0.2390]	[0.2161]	[0.4864]	[0.2004]	[0.3105]	[0.1668]	[0.2540]
Δ Illness shock - # days	0.0006	-0.0003	-0.0006	-0.0033	0.0008	0.0002	-0.0004	-0.0010
	[0.0016]	[0.0019]	[0.0018]	[0.0032]	[0.0015]	[0.0020]	[0.0012]	[0.0017]
Δ Unemployment shock - # days	-0.0009	-0.0031	0.0011	0.0023	-0.0018	-0.0022	-0.0014	-0.0021
	[0.0020]	[0.0033]	[0.0028]	[0.0051]	[0.0030]	[0.0035]	[0.0022]	[0.0029]
# of newborns	-0.3627*	-1.0388	-0.7143**	-9.9139*	-0.5476*	-4.0146	-0.4164*	-4.0327
	[0.1956]	[2.7966]	[0.3416]	[5.8861]	[0.2897]	[2.7991]	[0.2379]	[2.9866]
Δ Number of children under 14	0.1500	1.6631*	0.0444	3.1640*	0.1370	1.8911**	0.1169	1.9983**
	[0.1035]	[0.9176]	[0.1262]	[1.6556]	[0.1108]	[0.8758]	[0.1008]	[0.9860]
Observations	349	340	320	311	350	337	350	337
R-squared	0.83	-	0.80	-	0.78	-	0.84	-
p-value F tests relevance of instruments (1st)	-	0.0374	-	0.0881	-	0.0228	-	0.0492
p-value F tests relevance of instruments (2nd)	-	0.0300	-	0.0307	-	0.0221	-	0.0353
p-value Hansen test of overidentification	-	0.0478	-	0.2481	-	0.02531	-	0.1111
p-value F test: shock coeff = 0	0.8647	0.8314	0.0850	0.4742	0.8142	0.9210	0.6872	0.7797
p-value F test: dummy coeff = 0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
Coefficients for village dummy variables not shown. In Table 5, the Hansen test is run on the model excluding the dummies.
The endogenous variables are the number of newborns in 2004 and the change in the number of children under fourteen between 2003 and 2004. The instruments are household head age, age squared, the experience and schooling of the household head, and the number of members lagged.

Table 6. Village level regressions, with ΔShocks and [ΔShocks * 'Rich household' indicator]

	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Dependent variable →	Δ Food Consumption		Δ Non-Food Consumption		Δ Self Produced Food Consumption		Δ Total non-durable consumption	
Δ Adverse weather dummy	-0.0032	0.1750	0.5811***	0.8783**	0.0611	0.1171	0.1478	0.2593
	[0.1649]	[0.2597]	[0.1851]	[0.3866]	[0.1858]	[0.2742]	[0.1642]	[0.2673]
Δ Weather dummy * Rich hh	0.0527	-0.1148	-0.2767	-1.5366	-0.1839	-0.4746	-0.1892	-0.5474
	[0.2887]	[0.4649]	[0.3821]	[1.2140]	[0.3200]	[0.4785]	[0.2813]	[0.4721]
Δ Crop diseases dummy	-0.1803	0.0698	-0.7073*	-0.4499	-0.3342	-0.0540	-0.3228	-0.0701
	[0.2849]	[0.3593]	[0.4065]	[0.4750]	[0.3233]	[0.3781]	[0.2973]	[0.3487]
Δ Crop disease dummy * Rich hh	0.4304	0.9890	1.0125	2.0207**	0.8064	1.2717**	0.6885	1.2129*
	[0.5293]	[0.6233]	[0.6793]	[0.9592]	[0.5690]	[0.6435]	[0.5287]	[0.6226]
Δ Animal diseases dummy	-0.2272	-0.1800	-0.2207	0.0145	-0.0158	0.1669	-0.1021	-0.0008
	[0.2043]	[0.2852]	[0.2309]	[0.4209]	[0.1880]	[0.3096]	[0.1723]	[0.2411]
Δ Animal disease dummy * Rich hh	0.0027	0.6535	0.2738	1.2897	-0.9870*	-0.5682	-0.4956	0.0361
	[0.3655]	[0.5665]	[0.5381]	[0.9617]	[0.5086]	[0.6627]	[0.3899]	[0.5766]
Δ Illness shock - # days	0.0008	0.0004	-0.0008	-0.0040	0.0009	-0.0001	-0.0004	-0.0013
	[0.0017]	[0.0021]	[0.0019]	[0.0033]	[0.0015]	[0.0021]	[0.0012]	[0.0018]
Δ Illness shock * Rich hh	-0.0051	0.0031	0.0062	0.0269*	-0.0050	0.0041	-0.0014	0.0080
	[0.0041]	[0.0076]	[0.0053]	[0.0141]	[0.0044]	[0.0069]	[0.0043]	[0.0069]
Δ Unemployment shock - # days	-0.0014	-0.0036	0.0037	0.0007	-0.0042*	-0.0062**	-0.0025	-0.0046
	[0.0023]	[0.0037]	[0.0028]	[0.0046]	[0.0024]	[0.0032]	[0.0021]	[0.0033]
Δ Unemployment shock * Rich hh	0.0010	-0.0006	-0.0111	0.0066	0.0087	0.0132	0.0036	0.0083
	[0.0055]	[0.0118]	[0.0078]	[0.0191]	[0.0065]	[0.0089]	[0.0061]	[0.0090]
	-0.3553*	-1.0846	-0.7193**	-8.4155	-0.6037**	-3.4103	-0.4497*	-3.3764
# of newborn babies	[0.1954]	[3.6005]	[0.3034]	[6.8132]	[0.2985]	[2.8517]	[0.2438]	[3.1081]
	0.1522	2.1539*	0.0760	2.7268*	0.1277	1.8415**	0.1191	1.8932*
Δ # of children under 14	[0.1056]	[1.1784]	[0.1294]	[1.5181]	[0.1133]	[0.8666]	[0.1033]	[0.9680]
Observations	349	349	320	311	350	337	350	337
R-squared	0.83		0.81		0.79		0.84	
p-value F test: dummy coeff. = 0	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%. Coefficients for village dummy variables not shown.

Table 7. Village level regressions, with ΔShocks and [ΔShock * Amount received as help]

	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Dependent variable →	Δ Food Consumption		Δ Non-Food Consumption		Δ Self Produced Food Consumption		Δ Total non-durable consumption	
Δ Adverse weather dummy	0.0590	0.1595	0.5336***	0.6889*	0.1286	0.1315	0.1762	0.2352
	[0.1547]	[0.2134]	[0.1820]	[0.3700]	[0.1865]	[0.2436]	[0.1640]	[0.2637]
Δ Weather dummy * Help	-0.2335*	0.0560	0.1140	0.7207	-0.1590	0.1459	-0.0869	0.3561
	[0.1320]	[0.3256]	[0.0855]	[0.5699]	[0.1460]	[0.3891]	[0.1015]	[0.4913]
Δ Crop diseases dummy	-0.0906	0.2125	-0.5544	-0.0690	-0.1490	0.1842	-0.1962	0.2273
	[0.2548]	[0.3474]	[0.3514]	[0.5412]	[0.2910]	[0.3607]	[0.2647]	[0.3884]
Δ Crop disease dummy * Help	0.2497**	0.1869	0.4234***	0.3130	-0.0549	-0.1284	0.1467	0.0541
	[0.1170]	[0.1573]	[0.1580]	[0.2604]	[0.1465]	[0.1851]	[0.1211]	[0.1853]
Δ Animal diseases dummy	-0.2103	-0.0209	-0.1636	0.3633	-0.2259	0.0190	-0.2107	0.0541
	[0.1852]	[0.2857]	[0.2288]	[0.5109]	[0.2096]	[0.3089]	[0.1763]	[0.3083]
Δ Animal disease dummy * Help	-0.0109	-0.1177	0.0737	-0.1552	0.0251	-0.0842	0.0204	-0.1271
	[0.0378]	[0.0895]	[0.0714]	[0.1335]	[0.0360]	[0.0836]	[0.0323]	[0.1017]
Δ Illness shock - # days	0.0006	0.0009	-0.0011	-0.0014	0.0009	0.0012	-0.0004	-0.0000
	[0.0017]	[0.0020]	[0.0020]	[0.0034]	[0.0016]	[0.0021]	[0.0013]	[0.0020]
Δ Illness shock * Help	-0.0001	-0.0002*	0.0001	-0.0001	-0.0001	-0.0002	0.0000	-0.0002
	[0.0001]	[0.0001]	[0.0001]	[0.0002]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Δ Unemployment shock - # days	-0.0043	-0.0087	0.0029	0.0017	0.0036	0.0015	-0.0002	-0.0032
	[0.0037]	[0.0070]	[0.0041]	[0.0101]	[0.0050]	[0.0069]	[0.0038]	[0.0076]
Δ Unemployment shock * Help	0.0003	0.0005	-0.0002	-0.0000	-0.0005	-0.0004	-0.0001	0.0001
	[0.0002]	[0.0004]	[0.0003]	[0.0007]	[0.0003]	[0.0005]	[0.0002]	[0.0005]
# of newborns	-0.3402*	-0.3287	-0.7153**	-8.6073	-0.5359*	-2.7460	-0.4061*	-4.0579
	[0.1979]	[3.0531]	[0.3456]	[5.7883]	[0.2932]	[2.7896]	[0.2406]	[3.4072]
Δ # of children under 14	0.1317	1.8342*	0.0370	3.2803**	0.1207	1.7949**	0.1046	2.4497**
	[0.1092]	[1.0648]	[0.1304]	[1.6518]	[0.1152]	[0.8683]	[0.1043]	[1.2006]
Observations	349	349	320	320	350	350	350	350
R-squared	0.83		0.81		0.78		0.84	
p-value F test: dummy coeff. = 0	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Robust standard errors in brackets
significant at 10%; ** significant at 5%; *** significant at 1%
Coefficients for village dummy variables not shown.

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