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Household consumption risk and coping strategies in Tajikistan: Evidence from household surveys

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HOUSEHOLD CONSUMPTION RISK AND COPING STRATEGIES IN TAJIKISTAN: EVIDENCE FROM HOUSEHOLD SURVEYS

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Abstract

Forward-looking poverty analyses are essential for targeting and implementing poverty prevention interventions. In the presence of uncertainty and risk, the current poverty status of households is not a good indicator of whether they will be poor in the future. This paper examines consumption risk and risk-coping strategies in the case of Tajikistan, a country where frequent negative risks and adverse shocks are faced by its people. Our approach is to directly incorporate risk into the household welfare and poverty measures based on the financial concept of risk aversion and the volatility in welfare, measured by per-capita consumption. Using the derived measure of risk, we identify determinants of consumption risk and the use of coping strategies. The results show that higher risk and risk aversion is related to lower consumption and higher poverty. Household characteristics are important determinants of the consumption risk, while availability and accessibility of coping strategies are major factors for the choice of the coping strategies.

Keywords: consumption risk, poverty, coping strategies, Tajikistan

JEL Classification: I32, I38, I39

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1. INTRODUCTION

Households in developing countries face various risks, including climatic risks, natural disasters, macroeconomic shocks, and individual-specific shocks in their daily life. The exposure to risk results in volatility in household welfare, measured by household income or consumption. These fluctuations in household welfare bring about temporary movements in and out of poverty. Therefore, in the presence of uncertainty and risk, a household's current poverty status is not a good indicator of whether it will fall into or remain in poverty in the future.

Poverty measures such as that of Foster, Greer, and Thorbecke (1984) produce static indicators of the poverty status of households. However, poverty is a stochastic process in which a household's current welfare level is just a point measurement in time. For poverty prevention interventions, poverty studies should go beyond the static analysis of categorizing who is currently poor and assess who is likely to be poor in the future.

Forward-looking poverty assessments are particularly relevant for developing countries like Tajikistan, where negative risks and adverse shocks are frequent. Tajikistan has made significant achievements towards economic growth and poverty reduction since the early 2000s (Danzer, Diez, and Gatskova 2013). Nevertheless, the country remains the poorest country in Central Asia, and its economy is vulnerable to commodity price shocks and the economies of neighboring countries, particularly that of the Russian Federation. In addition to these macroeconomic shocks, individuals in Tajikistan face frequent natural disasters and climatic shocks, including floods, landslides, and earthquakes as well as individual-specific risks such as illness, death, and job loss. By experiencing frequent shocks and risks, households develop some types of coping strategies to smooth consumption and/or income. Nonetheless, consumption and income fluctuations remain generally high in developing countries (Townsend 1995).

The objective of this paper is threefold. The first objective is to derive a measure of household consumption risk based on the risk aversion concept and the variability of consumption over time. Second, based on the derived measure of consumption risk, we aim to determine sources of consumption risk. Third, in the face of adverse shocks and risks, the last objective of the paper is to identify determinants of the use of risk-coping strategies in the case of Tajikistan, using a panel dataset constructed from the Tajikistan Living Standards Measurement Surveys 2007 and 2009. Most studies of this type define a measure of vulnerability to poverty as a probability to fall into poverty and evaluate the impact of shocks on the movements in and out of poverty. Unlike previous studies, this paper does not rely on the concept of vulnerability, but directly incorporates risk into the measurement of household welfare and poverty status. Following Cruces and Wodon (2007), household consumption is adjusted for risk by taking into account the risk aversion and volatility of consumption. In addition, we define household consumption risk as a difference between the certainty equivalent consumption and observed consumption, and determine sources of risk using household and community characteristics. Using the measure of the consumption risk, we also identify determinants of the use of coping strategies. In the absence of data on shocks faced by households, our measure of risk is assumed to capture total shocks encountered by households.

The rest of the paper is organized as follows. Section 2 reviews relevant literature on the relationships between risk, vulnerability, and poverty. Section 3 describes the methodology and data used. Section 4 presents and discusses the results. Finally, Section 5 concludes.

2. LITERATURE REVIEW

Studies on poverty, risk, and vulnerability can be classified into three groups: consumption/income risk and risk sharing among households, vulnerability to poverty, and risk-adjusted poverty. Some of the earlier work on the problems of poverty and risk assessed *ex-post* impacts of observed negative shocks on welfare and poverty. For example, Dercon and Krishnan (2000a, 2000b) estimate consumption effects of several idiosyncratic shocks to agriculture, as well as adult illness and death in rural Ethiopia. Skoufias (2003) uses owed wages and forced leave or being unemployed to estimate changes in consumption in the Russian Federation. In the approach of these researchers, consumption is assumed to be insured against the idiosyncratic shock if the regression slope coefficient on the shock is zero. This approach has several limitations. First, self-reported shocks represent attributions of causality by respondents. A shock can be reported negative by one individual, but not by another. Second, in estimating consumption changes due to idiosyncratic shocks, there would likely be an omitted variable bias, as it is not possible to cover all idiosyncratic shocks faced by households. To correct this problem, some authors include changes in household income instead of shocks on the basis that income changes capture all idiosyncratic shocks on consumption. Another way to interpret the inclusion of changes in income is how well household consumption is insured against income risk. Jalan and Ravallion (1999) examine the impact of the income variability on changes in consumption in rural People's Republic of China and find that poorer households are less insured against income risk than non-poor households.

Another strand of the literature assesses vulnerability of households to poverty as an *ex-ante* or forward-looking concept. There are two approaches to assess vulnerability to poverty: vulnerability as expected poverty and vulnerability as low expected utility (Calvo 2016). In the vulnerability to expected poverty approach, pioneered by Christiaensen and Subbarao (2005), Chaudhuri, Jalan, and Suryahadi (2002), and Pritchett, Suryahadi, and Sumarto (2000), the vulnerability is usually defined as the probability that household welfare in terms of consumption or income will fall below the poverty line in the future. Recently, Dutta, Foster, and Mishra (2011) and Calvo and Dercon (2013) proposed variants of vulnerability analysis as expected poverty. This type of a measure of vulnerability is particularly important when a large proportion of the population is living just over the poverty line and their characteristics are significantly different from those of the poor. Determining who the vulnerable are when their characteristics differ from the poor is important for targeting and preventing future poverty. Additionally, this type of vulnerability approach can be implemented using cross-sectional data, although panel data are preferable whenever they are available. While studies applying this approach produce useful information regarding future poverty, they lack theoretical foundations for forward-looking targeting decisions (Calvo 2016).

On the other hand, the vulnerability as low expected utility approach defines the vulnerability as the difference between a certain level of the utility derived from certainty-equivalent consumption above which a household would not be considered vulnerable and the expected utility of consumption (Ligon and Schechter 2003). A recent study by Gunther and Maier (2014) modified this approach by using the households' current consumption as a reference rather than a pre-specified utility level. The low expected utility approach has an advantage to decompose the vulnerability into poverty and risk components. The risk components can further be divided into covariate and idiosyncratic risks. There are two drawbacks to this approach, however. First, the vulnerability is measured in units of utility (e.g., utils), which would be abstract

for policy makers to understand (Hoddinott and Quisumbing 2003). Second, measuring vulnerability by the low expected utility approach requires choosing a specific functional form for the utility function, which could affect the magnitude of the measure. Additionally, this approach requires panel data, which are mostly nonexistent in many developing countries.

Another stream of the literature does not depend on the concept of vulnerability but rather directly incorporates risk into the measurement of household welfare and thus of poverty. Household welfare measured in income or consumption is adjusted for risk based on the finance concepts of certainty equivalent return and risk awareness, as well as volatilities in income or consumption (Cruces and Wodon 2007). By assumption, households prefer income or consumption that they will get with certainty over income or consumption that bears risk. Thus, certainty equivalents are, by definition, lower than risky income or consumption at the mean. Additionally, although this approach derives a measure of risk and determines how risk affects welfare and poverty, it does not explicitly identify who is vulnerable to poverty. The vulnerability to poverty is a measurement of a combination of exposures to risk and capabilities of individuals to respond to such risks and shocks. Therefore, in this paper we combine this approach with an analysis of risk-coping strategies to better understand who is likely to be poor in the future.

3. METHODOLOGY

3.1 Measures of Risk-adjusted Consumption and Risk Premium

To derive measures of risk-adjusted consumption and risk premium, we follow the approach of Cruces and Wodon (2007), which uses the standard concepts of risk aversion and certainty-equivalent welfare. The measure of welfare chosen for this study is consumption because households tend to report consumption more accurately than income. We assume that households prefer stable consumption to variable consumption with the same mean. Thus, households would be willing to pay to avoid the uncertainty and receive more stable but lower welfare. Then, the certainty-equivalent consumption is determined by the degree of risk aversion of the household and by the variability of its per-capita consumption level.

Formally, the certainty-equivalent consumption of the household is the amount of consumption that yields the same mean level of utility as the consumption levels observed over time. According to Makdissi and Wodon (2003), this is formalized as:

$$\mathrm{u}(y_i) = \frac{1}{T}\sum_{t=1}^{T} u(x_{it}) \tag{1}$$

where y_i is the certainty-equivalent consumption of household i, x_{it} is observed household consumption at time t, and $u(.)$ is the utility function which is assumed to be continuous with a positive first derivative (non-satiation) and a negative second derivative (risk aversion). We choose a constant relative risk aversion (CRRA) function for $u(.)$ for its desirable properties regarding the relationship between the risk premium and the level of consumption. Therefore, Equation 1 becomes:

$$\mathrm{u(x)} = \begin{cases} \frac{x^{1-\delta}}{1-\delta}, & \delta \neq 0 \\ \log x, & \delta = 1 \end{cases} \tag{2}$$

where δ is the constant Arrow-Pratt relative risk aversion coefficient. Based on Equation 2, the certainty-equivalent consumption becomes:

$$y_i = \begin{cases} \left[\frac{1}{T}\sum_{t=1}^{T} x_{it}^{1-\delta}\right]^{\frac{1}{1-\delta}}, & \delta \neq 1 \\ \prod_{t=1}^{T} x_{it}^{1/T}, & \delta = 1 \end{cases} \tag{3}$$

If the household aggregate consumption and the CRRA coefficient are known, it is straightforward to compute the certainty-equivalent consumption using Equation 3. Once consumption aggregates for each household are obtained from household surveys, then the value of the CRRA coefficient must be chosen. In this paper, we do not formally estimate the CRRA coefficient, as we do not have any information about individuals' risk behavior in the database. Thus, estimated values from existing studies are taken. Most empirical and theoretical studies find that the value of the CRRA coefficient falls between 1 and 2, while some studies find values as high as 10. We apply values from 1 to 3 in our analysis.

Subsequently, risk or risk premium is defined as a difference between the certainty-equivalent consumption and observed or risky consumption. The concept of risk aversion implies that the certainty-equivalent consumption will be lower than the average value of observed or risky consumption.

3.2 Determinants of Risk

Using the derived measure of risk, sources of risks are determined empirically. In particular, we estimate the following model:

$$r_{it} = \beta_1 + \beta_2 z_{it} + \varepsilon_{it} \tag{4}$$

where r_{it} is consumption risk or risk premium facing household i at time t, and z_{it} is a vector of variables identifying household characteristics that could affect the level of risk. These variables include characteristics of the household and household head as well as regional dummy variables.

3.3 Determinants of Coping Strategies

High risk does not necessarily imply vulnerability to poverty. Indeed, poor households could be more risk averse and engaged in less risky and low-return activities, whereas richer households could afford to try out new technologies and risky, high-return activities. What makes households exposed to high risk vulnerable to poverty is their lack of abilities to cope with adverse shocks. To determine sources of the use of coping strategies, the following model was estimated.

$$s_i = \alpha_1 + \alpha_2 z_i + \alpha_3 r_i + \epsilon_i \tag{5}$$

where s_i is the dummy variable indicating whether a risk-coping strategy was used by household i, and all other variables are defined as before.

3.4 Data and Descriptive Statistics

The methodology described in the previous sub-section was applied to household panel data constructed from the Tajikistan Living Standards Survey (TLSS) 2007 and 2009, surveys that were jointly carried out by the World Bank and the United Nations Children's Fund (UNICEF). The data for TLSS 2007 were collected in two stages. In the first stage, a total of 4,860 households were interviewed of which 4,490 households were revisited in the second stage due to difficulties of reaching all the households. The TLSS 2009 revisited 1,503 households that were surveyed in 2007, creating a panel dataset of 1,503 households. The surveys are nationally representative, as well as able to produce reliable results at the urban-rural divide and within five administrative regions of the country.

The survey data were obtained from the World Bank website. The databases for each year contained raw data collected from the households as well as computed measures of consumption aggregates, poverty line, and poverty measures at the household level. The TLSS database contains a per-capita consumption measure which is aggregated on a household basis by including food and non-food consumption. The value of the consumption aggregate is deflated by regional price indices to adjust for differences in prices across regions. The consumption aggregates were used as a measure of welfare. Poverty lines were set for each survey year based on the cost of basic needs approach, and defined at 139 somoni and 162 somoni per month in 2007 and 2009 respectively. These national poverty lines were used in the computations of risk-adjusted poverty measures in this paper. Table 1 presents summary statistics of variables used in this study.

Table 1: Summary Statistics of Variables

Variable	Mean	Std. Dev.	Min	Max
Consumption risk (δ =1)	49.58	87.39	0.02	2,087.45
Consumption risk (δ =2)	49.55	99.53	0.02	2,376.90
Consumption risk (δ =3)	49.56	105.53	0.02	2,416.61
Per-capita monthly income	94.31	216.52	0.00	5,494.07
Household size	6.48	2.93	1	20
Dependency ratio	0.68	0.61	0	5
Number of the disabled and ill	0.51	0.83	0	6
Home owner	0.96	0.19	0	1
Agricultural land owner	0.65	0.48	0	1
Household head's characteristics				
Household head's age	52.21	13.39	20	97
Unemployed	0.38	0.49	0	1
Wage-employed (non-agriculture)	0.30	0.46	0	1
Wage-employed (agriculture)	0.06	0.23	0	1
Self-employed (non-agriculture)	0.15	0.36	0	1
Self-employed (agriculture)	0.11	0.31	0	1
Male	0.82	0.39	0	1
Female	0.19	0.39	0	1
Tajik	0.75	0.43	0	1
Uzbek	0.22	0.41	0	1

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Table 1 *continued*

Variable	Mean	Std. Dev.	Min	Max
Russian	0.02	0.12	0	1
Other	0.01	0.11	0	1
No education	0.04	0.19	0	1
Primary and basic	0.19	0.39	0	1
Secondary	0.58	0.49	0	1
Higher	0.19	0.39	0	1
Married	0.80	0.40	0	1
Divorced	0.02	0.13	0	1
Living together	0.00	0.04	0	1
Separated	0.01	0.09	0	1
Widow/er	0.17	0.37	0	1
Single	0.01	0.11	0	1
Regions				
Dushanbe	0.18	0.38	0	1
Sughd	0.26	0.44	0	1
Khatlon	0.25	0.43	0	1
Region of Republican Subordination (RRS)	0.21	0.41	0	1
Gorno-Badakhshan Autonomous Region (GBAO)	0.10	0.29	0	1

Std. Dev. = Standard Deviation; Min = Minimum; Max = Maximum.
Source: Authors' computation based on TLSS 2007 and 2009.

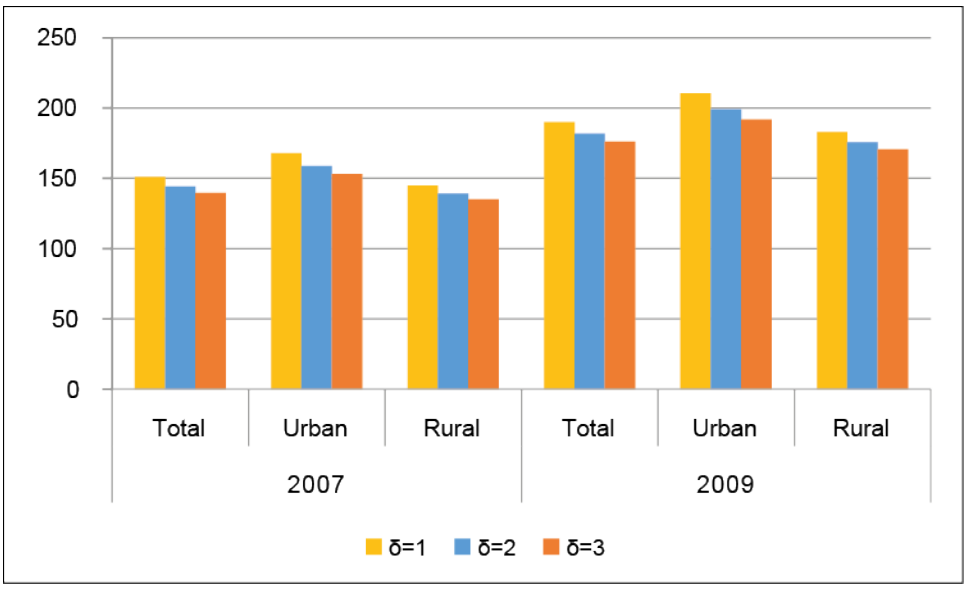
4. RESULTS AND DISCUSSION

Using Equation 3, we computed risk-adjusted or certainty-equivalent consumption for each household in the sample. Then we recalculated the poverty headcount ratio using the computed risk-adjusted consumption. For values of the CRRA coefficient, we followed existing studies and used values between 1 and 3. Figures 1 and 2 present results obtained for changes in per-capita monthly consumption and poverty headcount ratio for different values of the CRRA coefficient.

Results show that as the CRRA coefficient goes up, consumption declines and poverty increases. At the national level, the poverty headcount ratio is 0.43 when $\delta=1$ and increases to 0.50 when $\delta=3$ in 2009. Thus, poverty increases with higher levels of risk (aversion).

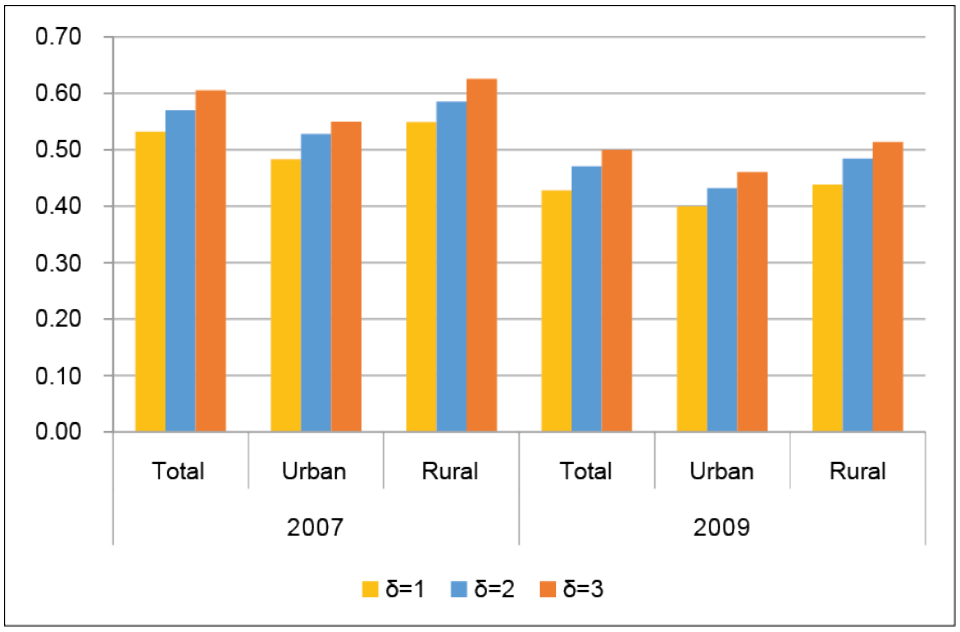
We also checked how many non-poor who were exposed to high risk in 2007 fell into poverty in 2009. Table 2 shows the share of households whose status changed from non-poor to poor between 2007 and 2009, by the degree of risk they face.

Figure 1: Per-capita Monthly Consumption by Location, in Somoni



Source: Authors' computation.

Figure 2: Poverty Headcount Ratio by Location



Source: Authors' computation.

Table 2: Share of Households that Fell into Poverty between 2007 and 2009 within Each Risk Group

	δ=1	δ=2	δ=3
Low risk	11.9	11.4	11.8
Moderate risk	27.4	27.2	27.7
High risk	57.8	59.1	59.2

Source: Authors' computations.

For convenience, the degree of risk to which households are exposed is classified into low (up to 5% of per-capita monthly consumption), moderate (5–20% of consumption), and high (more than 20% of consumption). Results show that there are no significant differences across different values of the CRRA coefficient. However, the percentage of households that fell into poverty is approximately five times higher within high-risk households than within low-risk households. When δ=3, almost 60% of non-poor households who were exposed to high risk in 2007 fell into poverty in 2009, as compared to about 28% and 12% of moderate and low-risk households respectively.

Table 3: Regression of Risk for Different Values of CRRA Coefficient

	δ=1	δ=2	δ=3
Household characteristics			
Per-capita income	0.113***	0.144***	0.156***
	(0.005)	(0.005)	(0.005)
Per-capita income^2	–0.00002***	–0.00003***	–0.00003***
	(0.000)	(0.000)	(0.000)
Household size	–11.151***	–12.788***	–12.931***
	(0.398)	(0.465)	(0.529)
Household size^2	0.479***	0.545***	0.548***
	(0.021)	(0.026)	(0.029)
Dependency ratio	–2.978***	–3.178***	–3.343***
	(1.041)	(1.110)	(1.034)
Dependency ratio^2	0.195	0.350	0.363
	(0.401)	(0.397)	(0.290)
Number of the disabled or ill	0.602**	0.803**	0.936***
	(0.270)	(0.313)	(0.342)
Home owner	–7.489***	–8.031***	–8.196***
	(1.478)	(0.952)	(1.933)
Agricultural land owner	–9.886***	–6.771***	–4.509***
	(0.729)	(0.882)	(1.139)
Household head's characteristics			
Age	1.464***	1.168***	1.325***
	(0.125)	(0.146)	(0.154)
Age^2	–0.012***	–0.009***	–0.010***
	(0.001)	(0.001)	(0.001)
Wage-employed (non-agriculture)	–1.593**	–3.721***	–4.873***
	(0.673)	(0.742)	(0.818)
Wage-employed (agriculture)	–4.667***	–4.481***	–5.782***
	(0.985)	(0.981)	(1.020)
Self-employed (non-agriculture)	–1.321	0.303	0.370
	(0.824)	(0.791)	(0.916)
Self-employed (agriculture)	–6.500***	–5.993***	–7.193***
	(0.693)	(0.758)	(0.815)
Female	4.575***	3.662***	3.669**
	(1.245)	(1.242)	(1.523)

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Table 3 *continued*

	δ=1	δ=2	δ=3
Uzbek	2.870***	1.156*	0.693
	(0.465)	(0.667)	(0.654)
Russian	–25.214***	–28.704***	–29.982***
	(3.960)	(4.482)	(4.916)
Other	–29.983***	–34.676***	–32.848***
	(5.152)	(5.103)	(5.386)
Primary and basic education	–0.347	1.142	2.164
	(1.178)	(1.117)	(1.435)
Secondary education	7.840***	8.787***	10.050***
	(1.263)	(1.211)	(1.510)
Higher education	7.910***	9.655***	13.224***
	(1.394)	(1.395)	(1.648)
Divorced	–8.395***	–8.197**	–1.310
	(3.066)	(3.717)	(3.876)
Living together	14.436	3.915	–3.640
	(11.763)	(16.156)	(18.283)
Separated	1.111	–2.939	–3.115
	(5.110)	(5.413)	(4.671)
Widow/er	–3.397***	–3.034**	–4.165***
	(1.246)	(1.257)	(1.514)
Single	9.870	7.730	11.139
	(7.658)	(8.243)	(8.389)
Regions			
Sughd	17.165***	11.602***	11.065***
	(1.043)	(1.137)	(1.341)
Khatlon	10.179***	8.334***	8.101***
	(1.065)	(1.082)	(1.279)
RRS	16.990***	18.206***	18.053***
	(1.144)	(1.002)	(1.303)
GBAO	2.901**	1.901*	1.506
	(1.123)	(1.144)	(1.401)
Constant	40.594***	53.193***	44.580***
	(4.240)	(4.574)	(5.461)

Notes: Variables are in levels. Standard errors are in brackets.
***, **, and * refer to statistical significance at 1%, 5%, and 10% levels respectively.
Panel random effects GLS estimates.
Source: Authors' estimations.

From a policy perspective, determining sources of risk could be more useful and interesting. The regression analysis was carried out by using Equation 4. The Hausman test preferred the use of a random effects model to its fixed effects counterpart. Then the model was estimated using random effects generalized least squares with robust standard errors to correct for the heteroscedasticity.

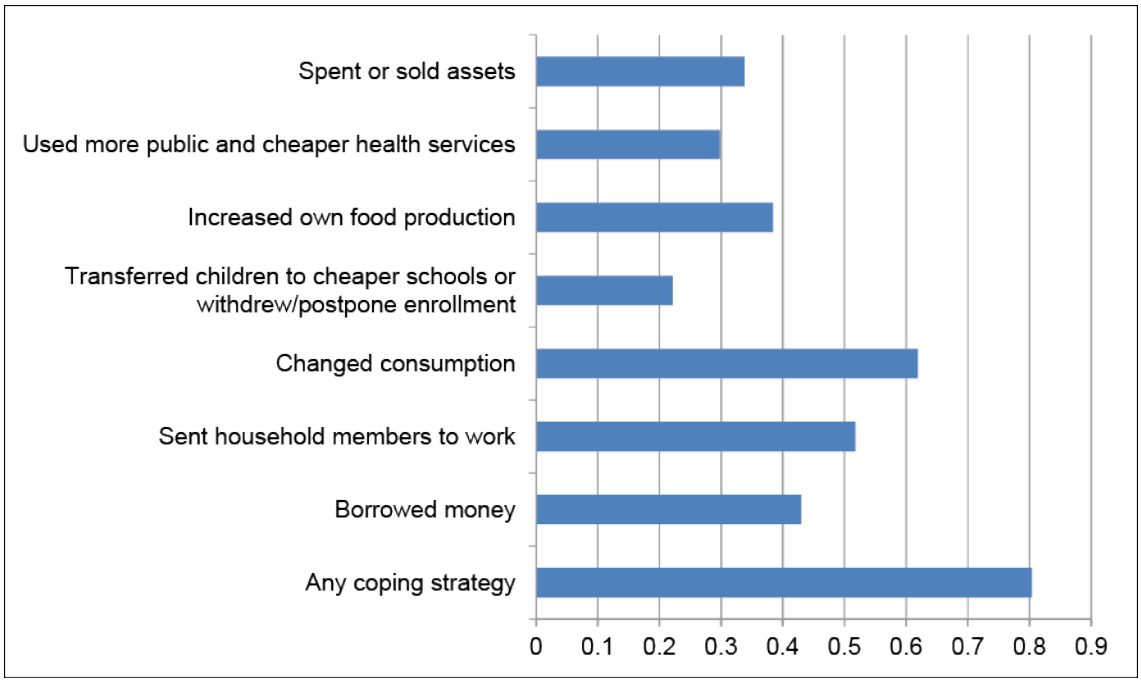
Table 3 presents the results of the regression analysis on risk for values 1 to 3. Per-capita income is positively correlated with the level of risk that a household faces. Thus, higher risk does not necessarily imply low income. Indeed, richer households could be engaged in high-risk and high-return activities, whereas poor households may be more risk averse and involved in less-risk and less-return activities. Larger households and those with more dependents tend to have lower risk. This could also imply that larger households with more dependents are more risk averse and prefer to be engaged in safe and less-risky activities. However, the relationship is not linear, and the level of risk starts to rise as the numbers of household members and dependents keep increasing. If a household has at least one disabled or chronically ill member, it increases the risk that the household faces, perhaps due to financial burdens as a result of having to pay for health care. After the collapse of the Soviet Union and the consequent civil war of the 1990s, Tajikistan's health system broke down. The country's public budget for the health sector is among the lowest according to the World Health Organization (about 24% as a share of total health sector expenditure in 2007), and private out-of-pocket payments dominate health care expenditures (Khodjamurodov and Rechel 2010). Owning physical assets such as a home and agricultural land reduces the risk that households are exposed to. Asset ownership could act as leverage for households when faced by shocks.

Characteristics of the household head, including age, gender, employment status, ethnicity, educational level, and marital status, have statistically significant impact on the household's exposure to risk. There is a non-linear relationship between age of household head and risk, in which the age increases risk with a decreasing rate. Compared to households with an unemployed head, households with an employed head face relatively lower risk, indicating that employment brings more stable income/consumption. Those who work in agriculture, both as wage earners and the self-employed, have much lower risk, which could show their high risk aversion. By the ethnicity of the household head, Uzbek households tend to have higher risk, and Russian and other ethnic minorities have lower risk, compared with the Tajik majorities. Higher risk exposure for households with educated heads, versus non-educated heads, may indicate that those with some level of education have more willingness to try new technologies or risky and profitable activities. Many of the marital status categories are not significant in all models, except for households in which the heads are divorced or widowed. These households tend to have less consumption risk than households with married heads, possibly indicating their high risk aversion.

Finally, the location of the household is an important and statistically significant determinant of the risk that it faces. Compared to households located in the capital city, Dushanbe, households in other areas tend to face much higher risk. Of such households, those in Sughd and RRS are exposed to more risk than the average households in Dushanbe and other regions. Although absolute poverty in the Sughd and RRS regions decreased by 21 and 9 percentage points respectively between 2007 and 2009 (TLSS 2007 and 2009), the exposure to risks may indicate a greater vulnerability to poverty due to high volatilities in household consumption in these regions. Residents of Dushanbe seem to be exposed to less risk, perhaps because the capital city provides better employment opportunities as well as infrastructure and social security facilities.

The exposure to risk alone does not translate into vulnerability to poverty. Negative shocks combined with inadequate risk management are the main sources of vulnerability. Thus, examining the existing mechanisms that households use to cope with adverse shocks in addition to their exposure to risk is more useful in terms of policy recommendation and formulation for preventing future poverty. Often this type of analysis requires detailed information about both idiosyncratic and aggregate shocks that households face (Hoddinott and Quisumbing 2003). However, in the absence of such data, we believe that our measure of risk can be used as total shocks faced by households, as it was derived by taking into account the variability of consumption and risk aversion.

Figure 3: Risk Coping Strategies



Source: Author's computations.

The TLSS 2009 collected data on 26 coping strategies, which are generally *ex-post* consumption-smoothing strategies in the face of shocks. By similarities, we grouped these coping strategies into seven groups: borrowed money, sent household members to work, changed/reduced consumption, transferred children to cheaper schools or withdrew/postponed enrollment, increased own food production, used public and cheaper health services, and spent/sold assets. Out of the total households, more than 80% use some kind of coping mechanism, of which the most common is to reduce or change consumption (Figure 3). The second most common coping strategy is sending household members to work. Indeed, official statistics show that Tajikistan is one of the most remittance-dependent countries due to its large number of migrant workers (World Bank 2009). According to Danzer, Dietz, and Gatskova (2013), remittances cover more than 35% of annual household consumption of recipients.

Using Equation 5, determinants of the use of coping strategies were estimated using a multivariate logit model. Table 4 provides the results for each coping strategy. Compared to low-risk households, high-risk households are less likely to use any coping strategies. This may indicate that high-risk households lack abilities to cope with risk and have higher volatility in consumption. While the degree of risk exposure

does not have significant impacts on borrowing money, changing consumption, and spending assets, it lowers the probabilities for sending household members to work, withdrawing children from school, and increasing the household's own food production. This may indicate that households that face high risk lack the means to use these coping strategies. On the other hand, high risk is not necessarily related to low income, and it may show that these high-risk households perhaps do not need these coping strategies to smooth consumption.

Poor and ethnic-minority households who live in the Khatlon and RRS regions are more likely to borrow money to cope against shocks. This could indicate that the poor and those who live in the Khatlon and RRS regions have tighter kinship networks, because these coping mechanisms covered in the survey include mostly borrowings from friends and family. Only a few cases included borrowings from informal moneylenders. Those households with a high dependency ratio and with heads who are older and self-employed in non-agriculture do not borrow money (perhaps they cannot due to inability to repay) to manage risks. Big households are more likely to send household members to work. Conversely, older female-headed households with a higher dependency ratio are less likely to send household members to work, as they may not have a member to send to work.

The use of coping strategies seems to depend on their availability and accessibility by households. For example, poor households in the Khatlon and RRS regions with at least one disabled or chronically ill member, whose head is employed in agriculture, tend to reduce their consumption to cope with shocks. The consumption reduction may be the most accessible means for these poor households to cope against shocks. Big households whose heads are self-employed in agriculture are likely to increase their own food production to cope with adverse shocks. This could mean that big households have more people to work within agriculture and increase food production.

Table 4: Odds-ratios for Determinants of the Use of Coping Strategies

	Any Coping Strategy	Borrowed Money	Sent Household Members to Work	Changed Consumption
Degree of risk				
Low risk (up to 5%)	(reference)			
Moderate risk (5–20%)	–0.264	–0.214	–0.382**	–0.174
	(0.218)	(0.171)	(0.173)	(0.173)
High risk (more than 20%)	–0.394*	–0.223	–0.426**	–0.123
	(0.212)	(0.169)	(0.170)	(0.168)
Household size	0.058**	0.017	0.097***	0.022
	(0.028)	(0.022)	(0.022)	(0.022)
Dependency ratio	–0.196*	–0.195*	–0.266**	–0.001
	(0.116)	(0.107)	(0.105)	(0.101)
Number of the disabled or ill	0.107	0.101	0.001	0.129*
	(0.084)	(0.066)	(0.070)	(0.069)
Poor	0.272*	0.379***	–0.119	0.241**
	(0.147)	(0.125)	(0.125)	(0.121)
Household head's age	–0.016***	–0.013**	–0.012**	–0.010**
	(0.006)	(0.005)	(0.005)	(0.005)

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Table 4 *continued*

	Any Coping Strategy	Borrowed Money	Sent Household Members to Work	Changed Consumption
Household head's employment				
Unemployed	(reference)			
Wage-employed (non-agriculture)	–0.204	–0.162	0.192	–0.264*
	(0.176)	(0.158)	(0.159)	(0.150)
Wage-employed (agriculture)	–0.802**	–0.405	0.266	–0.312
	(0.337)	(0.294)	(0.305)	(0.286)
Self-employed (non-agriculture)	–0.776***	–0.389**	–0.301	–0.560***
	(0.198)	(0.190)	(0.186)	(0.178)
Self-employed (agriculture)	0.526*	–0.114	0.124	0.414**
	(0.282)	(0.195)	(0.198)	(0.202)
Female-headed	0.046	0.149	–0.284*	0.137
	(0.187)	(0.163)	(0.165)	(0.157)
Household head's ethnicity				
Tajik	(reference)			
Uzbek	–0.227	–0.160	–0.164	–0.226*
	(0.167)	(0.141)	(0.138)	(0.136)
Russian	0.275	0.104	0.719	0.071
	(0.467)	(0.479)	(0.584)	(0.448)
Other minority	0.306	1.098**	0.139	0.193
	(0.527)	(0.507)	(0.630)	(0.517)
Household head's education				
No education	(reference)			
Primary and basic	–0.221	0.162	–0.306	–0.374
	(0.399)	(0.336)	(0.331)	(0.340)
Secondary	–0.251	0.130	–0.124	–0.350
	(0.381)	(0.329)	(0.319)	(0.329)
Higher	–0.470	–0.208	–0.354	–0.295
	(0.399)	(0.355)	(0.344)	(0.349)
Regions				
Dushanbe	(reference)			
Sughd	0.690***	0.083	1.423***	0.006
	(0.184)	(0.190)	(0.207)	(0.172)
Khatlon	1.567***	1.335***	1.733***	0.893***
	(0.221)	(0.193)	(0.211)	(0.184)
RRS	1.488***	0.819***	1.781***	0.325*
	(0.222)	(0.197)	(0.216)	(0.184)
GBAO	0.576**	–0.119	1.431***	0.109
	(0.246)	(0.252)	(0.247)	(0.223)
Constant	1.577***	–0.248	–0.702	0.891*
	(0.583)	(0.537)	(0.495)	(0.504)
Number of observations	1,503	1,503	1,503	1,503

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Table 4 *continued*

	Transferred or withdrew Kids from School	Increased Own Food Production	Used less Expensive Health Services	Spent or Sold Assets
Degree of risk				
Low risk (up to 5%)	(reference)			
Moderate risk (5–20%)	–0.356*	–0.490***	–0.394**	–0.110
	(0.195)	(0.185)	(0.176)	(0.180)
High risk (more than 20%)	–0.384**	–0.434**	–0.271	–0.067
	(0.189)	(0.179)	(0.171)	(0.175)
Household size	0.018	0.078***	0.011	0.070***
	(0.025)	(0.023)	(0.023)	(0.023)
Dependency ratio	–0.042	–0.112	–0.081	–0.175
	(0.126)	(0.113)	(0.112)	(0.112)
Number of the disabled or ill	0.128*	0.116	0.112	0.042
	(0.075)	(0.072)	(0.068)	(0.070)
Poor	0.123	–0.135	0.014	–0.072
	(0.145)	(0.133)	(0.131)	(0.132)
Household head's age	–0.004	–0.009	–0.015***	–0.001
	(0.006)	(0.006)	(0.006)	(0.006)
Household head's employment				
Unemployed	(reference)			
Wage-employed (non-agriculture)	–0.237	0.073	–0.182	–0.029
	(0.193)	(0.173)	(0.166)	(0.169)
Wage-employed (agriculture)	–0.125	0.253	–0.272	–0.505
	(0.353)	(0.286)	(0.319)	(0.319)
Self-employed (non-agriculture)	–0.052	–0.161	–0.248	0.128
	(0.225)	(0.205)	(0.201)	(0.194)
Self-employed (agriculture)	0.184	0.544***	0.154	0.482**
	(0.219)	(0.198)	(0.197)	(0.193)
Female-headed	0.122	–0.452**	0.211	0.037
	(0.191)	(0.184)	(0.167)	(0.174)
Household head's ethnicity				
Tajik	(reference)			
	0.009	–0.178	0.020	0.112
Uzbek	(0.164)	(0.144)	(0.147)	(0.142)
	0.986*	–0.581	1.053**	0.892*
Russian	(0.505)	(1.219)	(0.464)	(0.527)
	–0.827	0.784	–0.162	0.180
Other minority	(1.033)	(0.622)	(0.639)	(0.611)
Household head's education				
No education	(reference)			
Primary and basic	0.029	–0.526	–0.248	–0.423
	(0.387)	(0.333)	(0.334)	(0.343)
Secondary	0.201	–0.635**	–0.198	–0.196
	(0.376)	(0.325)	(0.324)	(0.333)
Higher	–0.008	–0.886**	–0.451	–0.244
	(0.411)	(0.356)	(0.354)	(0.357)

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Table 4 *continued*

	Transferred or withdrew Kids from School	Increased Own Food Production	Used less Expensive Health Services	Spent or Sold Assets
Regions				
Dushanbe	(reference)			
Sughd	0.630**	2.609***	0.353*	0.627***
	(0.245)	(0.394)	(0.206)	(0.217)
Khatlon	0.661***	3.081***	0.498**	1.226***
	(0.251)	(0.393)	(0.209)	(0.219)
RRS	0.697***	2.944***	0.526**	0.757***
	(0.261)	(0.394)	(0.214)	(0.230)
GBAO	0.511*	2.563***	0.691***	0.857***
	(0.303)	(0.423)	(0.249)	(0.269)
Constant	–1.744***	–2.241***	–0.049	–1.691***
	(0.592)	(0.644)	(0.510)	(0.540)
Number of observations	1,503	1,503	1,503	1,503

Note: Variables are in levels. Standard errors are in brackets.

***, **, and * refer to statistical significance at 1%, 5%, and 10% levels respectively.

Dependent variable = 1 if the household reported using the coping strategy.

Source: Authors' estimations.

By the household head's ethnic origin, Russian households tend to use more coping strategies, possibly because they have more means to cope with shocks. The TLSS data show that Russian minorities are relatively affluent in terms of access to health, education, and infrastructure facilities. The majority of the Russians have at least secondary education, and a much higher employment rate than the other ethnic groups. The Russians also tend to live in urban areas. These conditions may translate into Russians' use of more coping strategies, such as switching to cheaper schools or health providers, and selling assets.

5. CONCLUSION

The relationships between risk, vulnerability, and poverty have often been analyzed and reported in the literature by defining the vulnerability to poverty as a probability to fall into poverty. However, the existing literature has not reached a consensus about the concept of vulnerability to poverty, and it often lacks theoretical foundations for forward-looking poverty interventions. Unlike previous studies, the present study did not rely on any concepts of vulnerability, but directly incorporated risk into the measurements of consumption and poverty, based on risk aversion and volatility in consumption. While the exposure to risk alone does not imply that a household is vulnerable to poverty, we combined the analysis of consumption risk with that of the use of coping strategies to comprehensively understand how households manage risks to smooth consumption. The methodology was applied to household panel data from Tajikistan, a country particularly suitable for this type of forward-looking poverty analysis due to frequent shocks and risks faced by its people.

The results show that household consumption declines and poverty increases as risk (aversion) goes up. Higher exposures to risk are more likely to be translated into poverty. More than half of non-poor households who were exposed to high risk (more than 20% of consumption) in 2007 fell into poverty in 2009. Thus, higher risk aversion and exposures to risk are associated with the probability to fall into poverty.

Sources of risk were identified using a regression analysis of the derived measure of the consumption risk. Households having disabled or chronically ill members, and older and/or female heads, were found to be correlated with higher consumption risk, which could imply high consumption/income volatilities resulting from financial burdens of medical costs and limited job opportunities for these people. Higher income is not necessarily correlated with lower risk; rather, it leads to more risk, which could be a sign of less risk aversion among higher income earners. On the other hand, household size, dependency ratio, and asset ownership are related to lower risk. Increasing household size and dependency ratio could increase risk aversion, which leads to a preference for low-risk and low-return activities. Conversely, the ownership of assets could act as leverage to manage risks.

Households choose to use different types of coping strategies depending on availability and accessibility. For example, poor households are found to cope with shocks by reducing or changing their consumption pattern, which could be the most available way for them to cope. Large households tend to adjust their labor supply by sending a household member to work or increasing their own food production. On the other hand, more affluent households in urban areas are likely to use their assets to cope with shocks.

Although our analysis produced important results, it should be noted that there are some possible improvements for future studies of this type. First, restrictions imposed on the risk-adjusted consumption could be relaxed. For example, different types of utility functions, rather than the CRRA utility function, could be considered for a sensitivity check. Second, the CRRA coefficient could be explicitly estimated from the sample for each household to improve the realism of the study, although this method would be more data intensive. Last, our approach could be improved by differentiating between positive and negative risks to analyze the impacts of the negative risks explicitly, although our study takes into account the downward risk at mean.

Finally, some policy implications emerge from our analysis. As our results demonstrate that higher risk (aversion) is linked to higher poverty, risk mitigation strategies such as the development of credit and insurance markets, government safety nets, and training for jobs and income-earning activities should be promoted. Improvement in the health sector, particularly the introduction of a national health insurance system, would ease financial burdens faced by those with disability and chronic illness. Creating job opportunities for women, in particular, would also help mitigate risks faced by female-headed households. Broad infrastructure development, especially outside the capital city, could be an important factor for risk mitigation strategies, as the location of the household is a major determinant of risk. As self-reported coping strategies in the survey are mainly *ex-post* consumption-smoothing mechanisms, which could result in negative long-term implications for households' future welfare, public safety nets and insurance systems should be promoted.

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