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Economic Vulnerability and Poverty in Tajikistan[1]

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Abstract

We examine the profile of poverty and vulnerability in Tajikistan using household level panel data for 2004 and 2005. The drop in poverty was largely due to increase in remittances from workers working overseas. People are more likely to be poor if they live in a) rural areas, b) large households, c) households with a large proportion of children; or are pensioners or live in a household whose head is a pensioner. One half of the households observed to be non-poor are vulnerable to poverty. With expected utility approach, our analysis suggests that vulnerability associated with inequality is very large, whereas that from idiosyncratic risk is moderate. Aggregate shocks have been favorable and reduced vulnerability. We advance several policy recommendations.

Keywords: Poverty, Vulnerability, Panel data, Covariate and idiosyncratic risks.

JEL codes: C21, C23, I32

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I. Introduction

In the extant literature either income or consumption expenditures per capita as measured over short periods of time (say a year) have been regarded as proxies for the material well-being of households. However, economists have long recognized that a household's sense of well-being depends not just on its average income or expenditure, but also on the risks it faces. Hence vulnerability is a more satisfactory measure of (inadequate) welfare. The concept of vulnerability as used extends the notion of poverty to include idiosyncratic as well as covariate risks. If the policy makers design poverty alleviation policies in the current year on the basis of a poverty threshold of income in the previous year, "the poor" who receive income support may have already escaped from poverty and "the non- poor" who do not may have slipped into poverty due to various unanticipated shocks (e.g. changes in relative crop prices or an illness incapacitating the main bread winner).

Chaudhuri (2003) lists four reasons why vulnerability is important:

1. An atemporal or static approach to well-being, like poverty assessment, is of limited use in thinking about policy interventions to improve well-being that can only occur in the future.

2. Vulnerability assessment highlights the distinction between *ex ante* poverty prevention interventions and *ex post* poverty alleviation interventions.
3. Analysing vulnerability helps to investigate sources and forms of risks households face. This helps to design appropriate safety net programs to reduce or mitigate risk, hence vulnerability.
4. Vulnerability is an intrinsic aspect of well-being when individuals are risk averse.

Nevertheless, Holzmann and Jørgensen (2001) argue that poverty and vulnerability are closely related concepts due to two established facts: (i) the poor are typically most exposed to diverse risks, and (ii) the poor have the fewest instruments to deal with these risks. Thus, Chaudhuri et al. (2002) state:

"Poverty and vulnerability (to poverty) are two sides of the same coin.... So if we are able to generate predicted probabilities of poverty for households with different sets of characteristics (which some but not all poverty assessments attempt), we will have, in effect, estimates of the vulnerability of these households." (p.3)

The purpose of this paper is to analyse poverty and vulnerability in Tajikistan and to discuss policy options for ameliorating these. These issues have not been addressed in the extant literature. The plan of the paper is as follows. Section II discusses the concept of social risk management and vulnerability. Section III lays out strategies of measuring vulnerability. Section IV briefly discusses the recent performance of the economy of Tajikistan from 2000 to 2007. Section V uses panel data of 2004 and 2005 to construct profiles of poverty and vulnerability and examine the determinants of vulnerability in Tajikistan. Section VI concludes the paper. To the best of our knowledge, this is the first

analysis of vulnerability in Tajikistan.

II. Social risk management and vulnerability

Social risk management (SRM), encompassing deprivation as well as risk thereof, is concerned with four main issues (Holzmann and Jørgensen, 1999).

- *Vulnerability*: can be defined as the risk facing an individual or a household of falling below the poverty line or, for those already below the poverty line, to remain in or to fall further into poverty. Anti-vulnerability policies are designed to prevent this risk. Traditionally anti-poverty policy has been largely concerned with lifting the poor above the poverty line. Augmenting the static anti-poverty concept with the dynamic vulnerability concept through risk management measures should prove to be welfare enhancing.
- *Consumption smoothing*: Households are presumed to prefer spreading their expected income over a long period (i.e., they are risk-averse). This requires appropriate risk management instruments, such as saving and dissaving possibilities, in order to smooth their consumption path.
- *Improved equity*: Lower inequality eases constraints in the ability of the poor to smooth their consumption, resulting in better risk management (Holzmann and Jørgensen, 2001)
- *Economic development*: Undoubtedly, economic development is an important factor in reducing poverty.

Holzmann et al. (2003) argue that even among these issues vulnerability is the

central concept in SRM. They advance *three* definitions of vulnerability:

i) Vulnerability is the risk that a household will, if currently non-poor, fall below the poverty line, or if currently poor, will remain in poverty or fall deeper into poverty. Thus, vulnerability is synonymous with a high probability of becoming poor or poorer in the future. This definition is referred as *outcome approach* to vulnerability in Scaramozzino (2006).

ii) Vulnerability is the household's inability to smooth (insure) consumption when faced with income shocks while preserving a minimum level of assets. Thus, vulnerability is tantamount to consumption volatility. More precisely, household vulnerability is defined as the conditional covariance between changes in household consumption and changes in income, subject to an asset constraint.

iii) Vulnerability is the utility lost due to risks, as the difference between the expected household consumption and the certainty-equivalent consumption. This definition is referred as *utility-based approach* to vulnerability in Scaramozzino (2006). Specifically, the utility function can be decomposed into two distinct components measuring vulnerability: poverty and risk (covariate and idiosyncratic risk) (Ligon and Schechter, 2004; 2003).

III. Empirical approach to measuring vulnerability

In this paper we work with the first and third definitions of vulnerability. Because of data limitations we could not analyse household measures to protect consumption from related income shocks like consumption and income smoothing (see Christiaensen and Boisvert, 2002).

According to Holzmann et al. (2003), ideally, the empirical implementation of a vulnerability assessment requires panel data, and information on (i) the shocks that affect the households, and (ii) the household's ability to withstand those shocks. Such data are typically not available, especially in developing countries. In such cases cross-sectional data have often been used to estimate vulnerability. This is referred to as *vulnerability as expected poverty* (VEP), and is a second-best solution (Chaudhuri, 2003; Chaudhuri et al., 2002). We now provide a brief overview of the methodology used in VEP and VEU estimation.

a) Vulnerability as expected poverty (VEP)

With the *outcome approach*, when household level data are available, the vulnerability level of household *i* at time *t* is defined by

$$VEP_t^i = \Pr(c_{t+1}^i \leq z)$$

where c_{t+1}^i is the per capita consumption (or income) of household *i* at time t+1 and *z* is the per capita expenditure requirement defined as the poverty line. If we can estimate the ex ante probability distribution f of the consumption *c*, the vulnerability of household *i* can be identified as

$$VEP_t^i = \int_0^z f(c_{t+1}^i) \mathrm{d}c_{t+1}^i$$

Here, we assume that the environment is stationary so that the probability of future consumption outcomes remain the same across time (Ligon and Schechter, 2004). The major challenge in measuring vulnerability is the estimation of the probability distribution f (Christiaensen and Boisvert, 2002). Given limited data for two years, we

make the standard assumption that consumption is log-normally distributed as in Chaudhuri et al. (2002). Thus, vulnerability is estimated by

$$VEP_t^i = \Phi\left(\frac{\ln z - \ln c_{t+1}^i}{\sigma_i}\right)$$

where Φ is the cumulative log-normal distribution function.

Thus, to estimate a household's vulnerability we need to estimate its expected consumption and the variance of its consumption. To predict the consumption of household *i* at time *t+1* and the variance of consumption σ_i^2 we specify the following heteroscedasticity regressions:

$$\ln c^i = X_i\beta + \varepsilon_i \quad (1)$$

$$\sigma_{\varepsilon i}^2 = X_i\theta + e_i \quad (2)$$

where X_i represents a bundle of observed househousehold characteristics, such as the number of household members or the proportion of children in the household.

According to Chaudhuri et al. (2002), there are two vulnerability thresholds. The first is the observed current poverty rate in the population. The second threshold is 0.5, indicating that a household whose vulnerability level exceeds 50 percent is more likely than not to end up being poor and can thus be considered to be vulnerable. In this paper, we chose the later threshold so household *i* would be included among the vulnerable if $VEP^i > 0.5$.

b) Vulnerability as expected utility (VEU)

The *utility-based approach* is related to the concept of *risk-aversion*. Intuitively this implies that when facing choices with comparable returns, agents tend to choose the less-risky alternative. A simplified version of this problem is visualized in Figure 1. Let household per capita consumption, *c*, be a random variable which can take on two values, $\{c_1, c_2\}$ and let the probability that the consumption is low (c_1) or high (c_2) be the same. Consequently expected consumption, $Ec= (c_1+c_2)/2$. Let household utility function be a concave function *U* in *c*. Thus, expected utility $EU = (U(c_1) + U(c_2))/2$. The concavity of the utility function implies that the utility of expected consumption U(Ec) is greater than expected utility, EU.

Figure 1 here.

The *utility-based approach*, VEU is proposed by Ligon and Schechterd (2003) to contrast the expected utility derived from consumption against the utility derived from consumption of a particular bundle with certainty and is defined as:

$$VEU^i = U(z) - \mathrm{E}U(c^i)$$

where *z* is consumption at the poverty line and

$$\mathrm{E}U(c^i) = \frac{1}{T}\sum_{t=1}^{T} U(c_t^i)$$

As in Ligon and Schechterd (2003)

$$U(c) = \frac{c^{1-\gamma}}{1-\gamma}$$

and γ is chosen to equal 2.

Ligon and Schechterd (2003) decompose VEU into four distinct components

measuring poverty and three types of risk: covariate, idiosyncratic ane unexplained.

$$VEU^i = U(z) - U(\mathrm{E}c^i) \quad (3a)$$
$$+ \mathrm{E}U(c^i) - \mathrm{E}U[\mathrm{E}(c^i \mid \bar{x}_t)] \quad (3b)$$
$$+ \mathrm{E}U[\mathrm{E}(c^i \mid \bar{x}_t)] - \mathrm{E}U[\mathrm{E}(c^i \mid \bar{x}_t, x_t^i)] \quad (3c)$$
$$+ \mathrm{E}U[\mathrm{E}(c^i \mid \bar{x}_t, x_t^i)] - \mathrm{E}U(c^i) \quad (3d)$$

- The first term measures *poverty* where $\mathrm{E}c^i$ can be estimated by

$$\mathrm{E}c^i = \frac{1}{T}\sum_{t=1}^{T} c_t^i$$

  Ligon and Schechterd (2003) normalize the expenditure and income per capita so that the average expenditure and income per capita over all households in all periods equals 1 and z in the above equation equals 1. Hence, this term measures *inequality* as well

- The second and third terms measure *covariate risk* and *idiosyncratic risk*, respectively, where $EU[E(c^i \mid \bar{x}_i))$ and $EU[E(c^i \mid \bar{x}_i, x_i'))$ can be estimated by

$$E(c^i \mid \bar{x}_t) = \alpha^i + \eta_t$$

$$E(c^i \mid \bar{x}_t, x_t^i) = \alpha^i + \eta_t + x_t^i \beta$$

- The last term measures *unexplained risk* obtained by subtracting the first three terms from VEU.

IV. A Brief overview of the Tajikistan economy: 2000-2007

After a period of political instability and economic decline following the end of

Tajikistan's long civil conflict, the country has made substantial progress. Poverty incidence fell to 64% in 2004, from 81% in 1999 (Government of Tajikistan, 2005). Based on estimated poverty line for 2005, the poverty rate in 2005 was 62% (Table 1). This presents an enormous improvement over 1999. However, Tajikistan is the poorest Commonwealth of Independent States (CIS) country and one of the poorest countries in the world (Bureau of Public Affairs, USA).

The fall in poverty was driven by economic growth. Despite a low level of GDP per capita, Tajikistan experienced high GDP growth rate at an average of 8.9 % per year during 2000 to 2006 (01). Until recently cotton made a critical contribution to both the agricultural sector and the national economy. Within the agricultural sector, cotton accounts for 60% of agricultural output, supports 75% of the rural population, and uses 45% of irrigated arable land (Government of Tajikistan, 2007). Tajikistan has enjoyed a substantial increase in remittances per capita from its workers working overseas, particularly in Russia.

An important macro indicator contributing to people's vulnerability is the rate of inflation. Inflation erodes people's real wages and their purchasing power. Households are expected to be more vulnerable in the wake of fluctuations of price level, especially food price (Christiansen and Subbarao, 2005). Tajikistan experienced high inflation rates during the period from 2003 to 2007 with the inflation rate in 2007 climbing to 20%.

Another important source of covariate risk that affects people's vulnerability is trade. Aluminium and cotton are important source of export earnings for Tajikistan, contributing 52% and 11% to total exports in 2007, respectively (Bureau of Public Affairs, USA). Along with remittance flows from Tajik migrant workers abroad, mainly

in Russia, cotton and aluminium are main sources of foreign revenue so the economy is highly vulnerable to external shocks (Bureau of Public Affairs, USA).

The economic growth in Tajikistan was aided by rise in global prices for cotton which were estimated to be 45 per cent higher in 2003-04 compared to 1999-2000. Therefore, a substantial portion of the growth between 1999-00 to 2003-04 can be attributed to the expansion of the cotton market and rise in world cotton prices. However, the production and price of the cotton sector has dropped dramatically since 2003. This may be the reason the slow drop in poverty (2 percentage points) from 2004 to 2005. Indeed, two-thirds of the workforce of Tajikistan is in agriculture, most of them pressured to grow cotton (Bureau of Public Affairs, USA). However, since 2004 there has been a sharp upswing in remittance from Tajiks working abroad. Hence, in recent times aggregate shocks in Tajikistan have been favorable (high cotton prices until 2004 followed by high remittances from 2004). Hence, aggregate shocks in Tajikistan have lowered vulnerability in recent times.

However, the Tajik population's exposure to adverse idiosyncratic shocks, particularly health shocks, is high. According to Bureau of Public Affairs (USA) the quality of Tajikistan's medical infrastructure is poor, with severe shortages of basic medical supplies. Many trained medical personnel left the country during and following the civil war. There have been outbreaks of typhoid in the Dushanbe area and in the south, and the risk of contracting malaria, cholera, and water-borne illnesses is high. Throughout Central Asia, rates of infection of various forms of hepatitis and tuberculosis (including drug-resistant strains) are on the rise. Tuberculosis is an increasingly serious health concern in Tajikistan.

Table 1 here.

V. Data and results

a) Data

To construct profiles of poverty and vulnerability and examine the determinants of vulnerability, we use panel data for 2004 and 2005. The data we use come from a national representative household survey conducted in Tajikistan conducted by the State Committee on Statistics of the Republic of Tajikistan. The data cover expenditure, income and socio-economic characteristics of 925 households (300 urban and 625 rural) in Tajikistan over two years, 2004 and 2005. In addition to the capital city of Dushanbe, the country has several oblasts (regions): (i) Khatlon (comprising Kurban-Tube and Khulyab), which is an agricultural area with most of country's cotton growing districts; (ii) the Rayons of Republican Subordination (RRS) with the massive aluminium smelter in the west and agricultural valleys in the east growing crops other than cotton; (iii) Sugd, which is the most industrialized oblast; and (iv) Gorno-Badakhshan Administrative Oblast (GBAO), which is mountainous and remote, and with a small population. This is not covered by our sample.

Table 2 provides summary statistics for some of the key variables of interest.

Table 2 here.

Using the official poverty rate of 64% in 2004 and assuming the 2004 poverty rate is true for households in the sample we compute the poverty line for 2004. The poverty line for 2005 is estimated after adjustment using (CPI) inflation rates.

b) Poverty in Tajikistan

Table 1 indicates that the decline in price of the cotton sector prevented a significant decline in poverty between 2004 and 2005. Table 3 shows the incidence of headcount index of poverty during 2004-2005 by regions and areas. It can be seen that poverty in both rural and urban areas decreased slightly. Although poverty rates remained higher in rural than in urban areas, the difference between the two was unchanged between 2004 and 2005, since poverty in rural and urban areas both fell by 3%. Almost three quarters of Tajikistan's poor people lived in rural areas.

Table 3 here.

Gini coefficients in Table 3 and the Lorenz curves drawn in Figure 2 show that inequality was much higher in the rural areas as compared to urban areas. In both 2004 and 2005 the rural Gini was 0.53 whereas the urban Gini was 0.48 in 2004 and 0.44 in 2005. This indicates that high inequality reduced the poverty reducing impact of economic growth in the rural sector.

The rate of overall poverty reduction was fairly evenly distributed across the country.

Figure 2 here.

c) Vulnerability as expected poverty (VEP)

This subsection constructs the vulnerability profile of Tajikistan based on VEP estimation. Here, vulnerability profile is obtained by predicting the *ex ante* mean and variance for each household by applying equations (1) and (2) to each annual cross-sectional component of the 2-year panel data of Tajikistan. The cross-section results are

given in Table 4. Results based on GLS panel data are shown in the last column of the table.

Table 4 here.

The regression results for log consumption per capita are generally plausible and stable over time, except that proportion of children in the household is not significant in both years, but significant in the panel regression. In general, the estimation results illustrate that people in Tajikistan are more likely to be poor if they live in rural area and Dushanbe (see also Table 3), are members of a large household, or in households with a high proportion of children and pensioners or in a household who head is a pensioner.

There is strong statistical evidence to suggest that living in urban areas decreases the variance of consumption and living in Sugd increases it. This may indicate the possibility that households in urban areas can smooth their consumption through saving and borrowing or through insurance.

VEP measure is then constructed for each household for each year. A household was considered to be vulnerable to poverty if their consumption faces a chance of more than 50% of falling below the poverty line in the future. Table 5 shows that the predictive ability of our vulnerability is established. In 2004, we predict 65% households have a probability greater than 0.5 of being poor in the next year and actual poverty rate in 2005 was 62%.

Table 5 here.

Table 5 also shows that not all the poor are vulnerable while a significant proportion of the non-poor are vulnerable. Almost half of the households observed to be non-poor in 2004 and 2005 are estimated to be vulnerable to poverty. Thus poverty

reduction strategies need to incorporate not just alleviation efforts but also prevention. However, programs that aim to reduce the vulnerability in the population need to be targeted differently from those aimed at poverty alleviation.

Table 6 illustrates how poverty and vulnerability in Tajikistan differ by location and occupation of household heads. Relative to their share in the population, rural households are somewhat over-represented among the poor and the vulnerability. Moreover, the rural shares of both the poor and the vulnerable increased over the period 2004-2005. It can be seen that the poverty rate underestimates the well-being of rural households while the vulnerability rate is slightly higher than the poverty rate in both 2004 and 2005. It can also be seen that people in Khatlon are more exposed to vulnerability since this region is over-presented among the poor and the vulnerability, relative to their shares in the population.

Table 6 here.

However, the distribution of poverty and vulnerability over occupations of household head is fairly equivalent to their shares of the population. However, we found that households with a head working in service sectors became more vulnerable to poverty although they were less poor from 2004 to 2005. In contrast, households with a head working as a farmer became less vulnerable to poverty although they were poorer.

d) Vulnerability as expected utility (VEU)

Table 7 provides estimation results used to derive $E(c^i \mid \bar{x}_t)$ in (3b) and (3c). The coefficient of the year 2004 is negative, implying that the household faced a positive aggregate shock in 2005 thanks to economic growth and increased remittances (see Table 1).

Table 7 here.

Table 8 provides results of IV estimation. Since some explanatory variables are constant overtime in the model (regional variables) we can only use random-effects (instead of fixed-effects) regression (Wooldridge, 2002)). The first stage regression on log of household income per capita yields results similar to the panel regression on household consumption in Table 4. In the second stage, log of household consumption per capita is estimated by log of household income per capita. The coefficient of household income of 0.9658 in this estimation implies that consumption is determined largely by income. This can be explained by the inadequate development of credit markets in Tajikistan. This estimation result is used to estimate $E(c^i \mid \bar{x}_t, x_i)$ in (3c).

Table 8 here.

Table 9 decomposes average vulnerability (VEU) into average poverty (P), average covariate risk (AR), average idiosyncratic risk (IR), and average unexplained risk (UR). The coefficient value of 1.2555 at the top of the second column in VEU implies that the average utility of the whole households is 126% less than it would be if there is no inequality and risk in consumption. This estimate of VEU is larger than the Bulgarian estimate of 0.1972 in Ligon and Schechterd (2003) and Indian estimate of 0.7476 in Gaiha and Imai (2006). This large difference is due to the inequality and poverty which determines 81% of the vulnerability in Tajikistan.

Table 9 here.

Various types of risk account for the remaining vulnerability of households, with idiosyncratic risk is the most important while unexplained risk is quite insignificant. This

result is also different from estimate in Ligon and Schechterd (2003) which states that from the Bulgarian covariate risk is much more important than idiosyncratic risk. Covariate risk is less important than idiosyncratic risk and actually reduces vulnerability by 9%. Tajikistan has enjoyed a positive aggregate shock due to an increase in remittances from workers working overseas, particularly in Russia.

Because idiosyncratic risk is the main source of risk for Tajikistan (27%), social risk management should rely on informal, market-based and public provided arrangements (Holzmann and Jørgensen, 2001).

Also in Table 9, we regress each component of vulnerability on time series means of various household characteristics to explore the determinants of vulnerability. Determinants of poverty in VEU and those of VEP measures (in Table 4) are quite similar. Households in urban areas tend to have a lower VEU measure because of the lower inequality (see Figure 2) and because these households are less vulnerable to idiosyncratic shocks. The reason households in urban areas are less vulnerable to idiosyncratic shocks is because they can protect their consumption from related income shocks through credit and insurance markets which are absent in rural areas. However, urban households tend to gain less from positive aggregate shocks than rural households. This may be due to the fact that workers who work overseas and send remittances back home are usually rural people. A larger household tends to have a higher vulnerability because of higher poverty and greater vulnerability to idiosyncratic shocks.

VI. Conclusions

In this study, along with the profile of poverty, we measured the extent of vulnerability, examined the relative importance of its different determinants, and

suggested policy interventions to reduce vulnerability in Tajikistan. The analysis was based on a two period panel data of 925 households, for 2004 and 2005.

Our VEP estimated results show that people in Tajikistan are more likely to be poor if they live in rural area, are members of a large household, or in households with a high proportion of children and pensioners or in a household who head is a pensioner. Moreover, there is strong statistical evidence to suggest that living in urban areas decreases the variance of consumption and living in Sugd increases it. This may indicate the possibility that households in urban areas can smooth their consumption through saving and borrowing or through insurance.

We also found that the faction of the population that faces a risk of poverty in the future is fairly equal to the fraction that is observed to be poor. However, the distribution of vulnerability across different segments of the population can differ significantly form the distribution of poverty. As a result, households with a head working in service sectors became more vulnerable to poverty although they were less poor in 2005 as compared to 2004. Meanwhile, households with a head working as a farmer became less vulnerable to poverty although they were poorer. Thus, programs that aim to reduce the vulnerability in the population need to be targeted differently from those aimed at poverty alleviation.

In terms of the VEU approach, according to Chaudhuri (2003), a household's vulnerability to poverty depends on its future income prospects, the degree of its income volatility due to aggregate shocks and/or idiosyncratic shocks, and its ability to smooth consumption in the face of these shocks. The sources and the forms of shock matter. To reduce idiosyncratic more reliance should be placed on informal or market-based risk management instruments; for the covariate risk, more government involvement tends to

be required (Holzmann and Jørgensen, 2001).

Our VEU estimated results suggested that, in Tajikistan, vulnerability associated with inequality is very large. The vulnerability arising from idiosyncratic risk is also significant but has much less impact than inequality. This suggests that to reduce household's vulnerability Tajikistan needs to first reduce inequality. Lower inequality would ease constraints on ability of the poor to smooth their consumption, resulting in better risk management (Holzmann and Jørgensen, 2001).

We also found that for households in Tajikistan aggregate shocks have so far been benign. The high incidence of adverse idiosyncratic risk indicates that informal or market-based risk management instruments, such as credit and insurance market, need to be enhanced. Risk-coping ability is likely to differ among households because of differences in assets, such as livestock, crop inventory and currency. As a result, the poor (mostly assetless) are more likely to increase child or adult labour hours. So there is a case for more effective risk reducing, mitigating and coping interventions alongside income augmenting policies.

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Figure1: Vulnerability and poverty

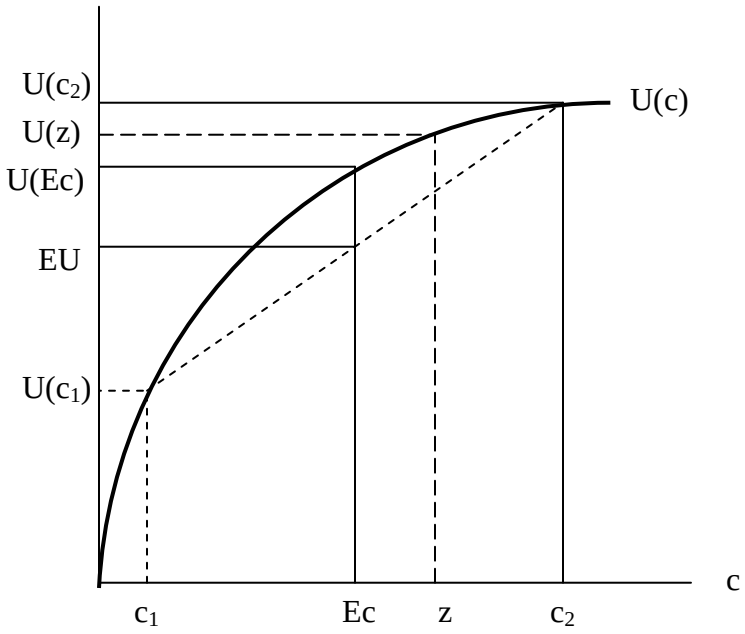
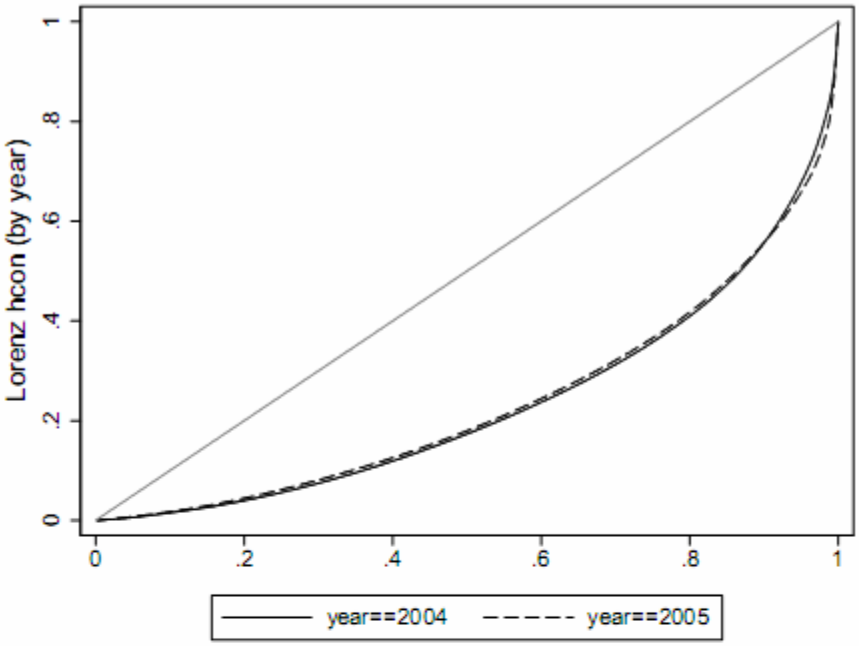
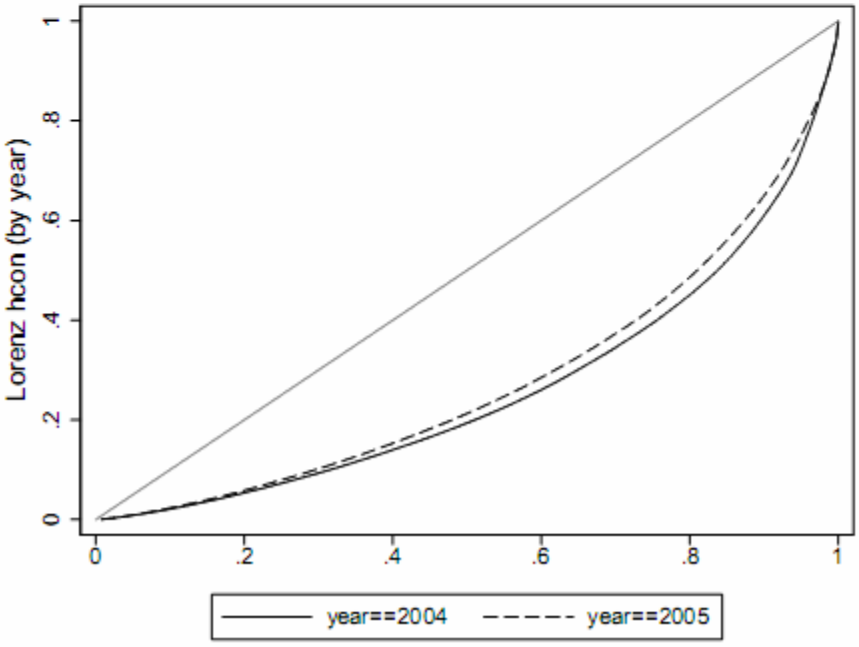


Figure 2: Lorenz consumption curves for urban and rural areas



(a) Rural area by years



(b) Urban area by years

Table 1: Selected economic and development indicators in Tajikistan, 2000-2007

	2000	2001	2002	2003	2004	2005	2006	2007
Poverty rate (% population)	…	…	…	…	64	62*	…	…
Life expectancy at birth, total (years)	65.3	…	65.9	…	…	66.4	66.5	…
Population growth (annual %)	1.2	1.2	1.1	1.1	1.2	1.3	1.4	…
Urban population (% of total)	25.9	25.7	25.4	25.2	24.9	24.7	24.6	…
GDP per capita (constant 2000 US$)	159	173	186	203	222	234	247	…
GDP growth (annual %)	8.3	10.2	9.1	10.2	10.6	6.7	7.0	6.9
Exports of goods and services (% of GDP)	86.7	66.6	64.6	63.4	58.3	26.0	23.2	…
Exports of goods and services (annual % growth)	2.8	-14.5	7.6	29.5	22.6	2.9	6.4	…
Cotton export (% total exports)	…	…	…	24	18	16	9	11
Cotton export ($/T)	…	…	…	1.30	1.21	1.08	1.06	
Remittances per capita (US$)	…	…	…	38	64	96	160	246
CPI (% change per year)	…	…	…	12	16.3	8	7.1	20

Sources: *:* CIA World Factbook 2007. ADB 2008. State Statistics Committee of Tajikistan. WDI (World Bank)

Note: *Our estimate.

Table 2: Summary Statistics for Tajikistan: 2004-2005

Variable	Mean	Std. Dev.	Min	Max
2004				
Hh annual income per capita (somoni)	7,302	11,783.5	245	157,292
Hh annual consumption per capita (somoni)	7,307	11,781.8	245	157,292
Hh size	6	2.6	1	20
Number of children up to 16	2	1.58	0	8
Number pensioners not working	0.3	0.61	0	5
Number of workers	2	1.07	0	7
2005				
Hh annual income per capita (somoni)	8,850	15,582.1	810	214,900
Hh annual expenditure per capita (somoni)	8,836	15,584.1	810	214,900
Hh size	6	2.6	1	20
Number of children up to 16	2	1.57	0	8
Number pensioners not working	0.3	0.59	0	3
Number of workers	2	1.13	0	8

N.B. Number of observations in each year is 925.

Table 3: Poverty by areas and regions 2004-2005

	2004				2005			
	Proportion (%) of		Head count	Gini	Proportion (%) of		Head count	Gini
	population	poor	ratio (%)	coeff.	population	poor	ratio (%)	coeff.
By area								
Rural	68	71	68	0.53	68	72	65	0.53
Urban	32	29	56	0.48	32	28	53	0.44
By region								
Dushanbe	11	13	78	0.39	11	12	70	0.37
RRS	22	21	62	0.47	22	22	63	0.41
Sugd	32	24	47	0.54	32	23	44	0.53
Khatlon	35	42	77	0.45	35	43	75	0.45
Tajikistan	**100**	**100**	**64**	**0.52**	**100**	**100**	**62**	**0.51**

Table 4: Regression results for VEP measure (2004 - 2005)

	2004				2005				GLS	
	Log c		Variance		Log c		Variance		Panel Estimation	
Dependent variable	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	z
Regions										
RRS	1.2154	15.13***	-0.0064	-0.04	1.1992	15.91***	0.0135	0.09	0.8121	8.20***
Sugd	1.0603	12.95***	0.3968	2.95***	1.2657	17.33***	0.3367	2.54**	0.9176	10.49***
Khatlon	0.6066	8.24***	0.1532	1.13	0.7402	11.51***	0.1934	1.43	0.3849	4.33***
Urban	0.5161	7.65***	-0.1870	-1.86	0.2953	4.65***	-0.2329	-2.39**	0.2841	4.42***
Hh characteristics										
Hh size	-0.2395	-7.55***	-0.0126	-0.25	-0.2426	-7.55***	-0.0706	-1.43	-0.2298	-7.48***
Hh size squared	0.0083	4.04***	-0.0004	-0.12	0.0074	3.68***	0.0019	0.60	0.0090	4.48***
Prop. of children up to 16	-0.1711	-1.51	-0.2971	-1.75	-0.1283	-1.17	-0.2661	-1.56	-0.3326	-3.34***
Prop. of pensioners not working	-0.5602	-2.98***	-0.1568	-0.53	-0.4304	-2.34**	-0.7519	-2.65***	-0.5295	-3.34***
Occupation of hh head										
Service	0.2100	1.92*	0.1063	0.41	0.2573	1.53	-0.3456	-1.41	0.2354	1.74*
Farmer	0.3871	3.02***	0.3037	1.14	0.3387	1.90	-0.2446	-0.97	0.3304	2.35**
Self-employed	0.2544	1.84*	0.3093	1.13	0.1719	0.95	-0.2030	-0.79	0.3236	2.25**
Constant	8.4657	47.46***	0.4844	1.58	8.6871	41.88***	1.1999	3.96***	8.8229	50.06***
No. of observations	925		925		922		922		1850	
F	52.57		5.26		71.32		4.56		Wald Chi^2 (11) = 401.5	
R squared	0.3878		0.0595		0.4630		0.0521			

Note: * indicates the coef. is sign. at 10%, ** at 5%, *** at 1% level

Table 5: Percentage of households poor and vulnerable, 2004-05

	Non vulnerable	Vulnerable	% of population
2004			
Non poor	54	46	**36**
Poor	24	76	**64**
% of population	**35**	**65**	**100**
2005			
Non poor	54	46	**38**
Poor	28	72	**62**
% of population	**38**	**62**	**100**

Table 6: Poverty and vulnerability within different segments of the population

	2004			2005		
	population	poor	vulnerable	population	Poor	vulnerable
By area						
Rural	68	71	79	68	72	74
Urban	32	29	21	32	28	26
By region						
Dushanbe	11	13	14	11	12	16
RRS	22	21	18	22	22	22
Sugd	32	24	20	32	23	11
Khatlon	35	42	48	35	43	51
By occupation of hh head						
Service	48	51	49	46	46	50
Farmer	36	35	36	34	36	31
Pensioner	12	10	11	15	14	15
Self-employed	5	5	4	5	5	4
Tajikistan	**100**	**100**	**100**	**100**	**100**	**100**

Table 7: Regression results for covariate shocks - Random-effects regression

Log hh consumption per capita	Coef.	z	P > |z|
Year 2004	-0.208	-8.33	0.000
Constant	-0.371	-13	0.000
σ_u	0.6819		
σ_e	0.5369		
ρ	0.6173	(fraction of variance due to u_i)	

Table 8: Regression results for idiosyncratic shocks - Random-effects IV regression

	First stage		Second stage	
	Log hh income per capita		Log hh consumption per capita	
	Coef.	z	Coef.	z
Log hh income per capita			0.9658	25.93
Regions				
RRS	0.8356	9.94	0.0314	1.00
Sugd	0.9052	12.20	0.0306	0.88
Khatlon	0.3840	5.12	0.0143	0.90
Urban	0.2899	5.31	0.0123	1.04
Hh characteristics				
Hh size	-0.2121	-7.47	-0.0059	-0.67
Hh size squared	0.0082	4.50	0.0001	0.41
Prop. of children up to 16	-0.2182	-2.16	-0.0146	-1.06
Prop. of pensioners not working	-0.4455	-2.60	-0.0197	-0.76
Occupation of hh head				
Service	0.1694	1.26	0.0063	0.48
Farmer	0.2793	2.02	0.0144	0.93
Self-employed	0.2416	1.71	0.0051	0.34
Whether in the year 2005	-0.2176	-6.79	-0.0038	-0.45
Prop. of workers	0.2841	2.21	…	…
Constant	-0.3387	-1.82	-0.0123	-0.84
No. of observations	1850		1850	
Wald $Chi^2(13)$	586		86661.4	
σ_u			0.0229154	
σ_e			0.0577715	
ρ			0.1359465	

Table 9: Decomposing VEU into its components

	V		P	AR	IR	UR
Average value	**1.2555**	**=**	**1.0165**	**- 0.1117**	**+ 0.3434**	**+ 0.0073**
Regions						
RRS	-1.730***		-1.567***	0.424***	-0.575***	-0.012
Sugd	-1.637***		-1.549***	0.402***	-0.490***	0
Khatlon	-0.554**		-0.418**	0.037	-0.169*	-0.004
Urban	-0.785***		-0.678***	0.184***	-0.286***	-0.005
Hh characteristics						
Hh size	0.440***		0.387***	-0.101***	0.154***	0.001
Hh size squared	-0.016***		-0.014***	0.003**	-0.006**	0
Prop. of children up to 16	0.275		0.261	-0.024	0.035	0.003
Prop. of pensioners not working	0.468		0.082	0.26	0.113	0.014
Occupation of hh head						
Service	-0.591		-0.777*	0.371**	-0.191	0.006
Farmer	-0.812*		-1.033**	0.452***	-0.234	0.004
Self-employed	-0.675		-0.949**	0.441***	-0.179	0.012
Constant	1.172**		1.227**	-0.333**	0.277	0.001
No. of observations	925		925	925	925	925
R squared	0.2202		0.2528	0.1961	0.131	0.00935

Notes: * indicates the coef. is sign. at 10%, ** at 5%, *** at 1% level.

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