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Asian Countries

Raghbendra Jha
and
Tu Dang

The Arndt-Corden Division of Economics
Research School of Pacific and Asian Studies
ANU College of Asia and the Pacific

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Raghbendra Jha

And

Tu Dang

The Arndt-Corden Division of Economics
Research School of Pacific and Asian Studies
College of Asia and the Pacific
The Australian National University

Corresponding Address :
Raghbendra Jha
Australia South Asia Research Centre
The Arndt-Corden Division of Economics
Research School of Pacific & Asian Studies
College of Asia and the Pacific
The Australian National University
Email: R.Jha@anu.edu.au

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Vulnerability to poverty in select Central Asian Countries[*]

Raghbendra Jha, **Tu Dang**

The Arndt-Corden Division of Economics,

RSPAS, College of Asia and the Pacific, ANU

Abstract

Economists have long recognized that a household's sense of well-being depends not just on its average income or expenditures, but also on the risks it faces. Hence vulnerability is a more satisfactory measure of welfare than poverty. In this paper we measure the extent of vulnerability as expected poverty, examine the importance of its determinants in the following four Central Asian countries: Azerbaijan, Kazakhstan, Kyrgyzstan, and Tajikistan. We find that the fractions of the populations of these countries facing the risk of poverty are considerably different from those observed to be poor. Moreover, the distribution of vulnerability across different segments of the population can differ significantly from the distribution of poverty. In addition, there is a sizable fraction of the population in these countries who were observed to be non-poor but are estimated

Keywords: Poverty, Vulnerability, Cross-section data, Central Asia

JEL codes: C21, C23, I32, O57

I.   Introduction

In the extant literature either income or consumption expenditures, 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 expenditures, but also on the risks. Hence vulnerability is a more satisfactory measure of welfare. The concept of vulnerability used extends the notion of poverty to include idiosyncratic as well as system-wide risks. If 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 receive income 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) listed four reasons why we should be concerned about vulnerability:

- A temporal 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.
- Vulnerability assessment highlights the distinction between ex-ante poverty prevention interventions and ex-post poverty alleviation interventions.
- 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.
- Vulnerability is an intrinsic aspect of well-being with the assumption that individuals are risk averse.

According to Holzmann and Jørgensen (2001), poverty and vulnerability are closely related concepts due to two established facts: (i) the poor ar 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 that:

"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 selected Central Asia countries. The countries studied are Azerbaijan, Kazakhstan, Kyrgyzstan and Tajikistan. The paper begins, in Section II, by discussing the concept of social risk management and vulnerability. Section III lays out strategies to measure vulnerability for cross-section data. Section IV briefly introduces salient economic and poverty characteristics of these countries. Section 5 estimates determinants of vulnerability to poverty. Section 6 sketches a profile of vulnerability in these Central Asia countries. To the best of our knowledge, this is the first analysis of vulnerability for these central Asian countries. Section 7 concludes the paper.

II.   Social risk management and vulnerability

Globalization leads to improvements in welfare but can also increase income variability. Thus, according to Holzmann and Jørgensen (1999), social risk management (SRM) is concerned about four main issues:

- *Vulnerability*: can be defined as the risk of an individual or a household to fall 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. Meanwhile, traditionally, anti-poverty policy is only concerned with bringing the poor up to the poverty line. Enhancing the static anti-poverty concept with the dynamic vulnerability concept through risk management measures should prove to be welfare enhancing.
- *Consumption smoothing*: Individuals are presumed to prefer spreading the 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 the consumption path.
- *Improved equity*: Enhanced equity eases constraints in the ability of the poor to smooth their consumption, resulting in a better risk management (Holzmann and Jørgensen, 2001)

- *Economic development*: Undoubtedly, economic development is an important factor in reducing poverty.

Among the above issues, vulnerability is the central concept of SRM (Holzmann et al., 2003). Holzmann et al. (2003) review *three* definitions of vulnerability:

1. 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).

2. Vulnerability is the households' ability to smooth (insure) consumption when faced income shocks while preserving a minimum level of assets. Under this approach, vulnerability is tantamount to consumption volatility. More precisely, household vulnerability is the conditional covariance between changes in household consumption and changes in income, subject to an asset constraint.

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

III. Empirical strategy of measuring vulnerability

This section discusses econometric methods for vulnerability assessments corresponding to the first definition of vulnerability – outcome approach. Ideally, according to Holzmann et al. (2003), the implementation of a vulnerability assessment requires panel data, and information on (i) the shocks that affect the households, and (ii) the household ability to withstand those shocks. Such data are typically not available, especially in developing countries. However, cross-sectional data   have

been advised to estimate vulnerability, namely *vulnerability as expected poverty* (VEP), as a second-best solution (Chaudhuri, 2003; Chaudhuri et al., 2002).

With VEP, the vulnerability level of household (or individual) 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 capital 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

$$VEP_t^i = \int\limits_0^z f(c_{t+1}^i)\mathrm{d}c_{t+1}^i$$

Here, we assume a stationary environment where the probability of possible future consumption outcomes remain the same across time (Ligon and Schechter, 2004).

The major challenge in measuring vulnerability is to estimate the probability distribution f (Christiaensen and Boisvert, 2002). Given a limited panel data set for two years, in the case of Tajikistan, we assume that consumption is log-normally distributed as in Chaudhuri et al. (2002).[*] Thus, the vulnerability is estimated by

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

with 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

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[*] With a panel data of sufficient length we can directly estimate the probability distribution of the household's consumption without the need for auxiliary assumptions.

household i at time $t+1$ and the variance of consumption σ_i^2 we specify the following heteroscedasticity regression:

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

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

where X_i presents a bundle of observed house household characteristics, such as the number of household members or the proportion of children.

According to Chaudhuri et al. (2002), there are two vulnerability thresholds. The first is the observed current poverty rate in the population. The alternative thresholds is 0.5. This threshold indicates 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 a household i would be included among the vulnerable if $VEP^i > 0.5$.

IV.   Economic and poverty situation in the Central Asian countries

After gaining independence in 1991, the Central Asian countries initiated a transition to market economies resulting in severe economic hardships for most of the population. The sharp output declines along with hyperinflation resulting from price liberalization and the monetization of large fiscal deficits led to significant increases in poverty (Bandara et al., 2004/05). Since 1995, the Central Asian countries have pursued anti-inflation policies and initiated macroeconomic reforms which led to economic recovery and greater price stability (see Table 1 and Figures 1 and 2). As a result, the incidence of poverty in the Central Asia tends to decrease, especially in Kazakhstan. The incidence of poverty reached 68% in Armenia in 1995, 35% in Kazakhstan in 1996, 48% in Kyrgyzstan in 2001, and 75% in Tajikistan in 1999. The poverty rates then decreased to 50% in Azerbaijan in 2001, 15% in Kazakhstan in 2002, 43% in Kyrgyzstan in 2005 and 62% in Tajikistan in 2005 (Table 2).

[Tables 1 and 2 and Figures 1 and 2 here.]

However, the transition to a market economy also increased income inequality within the countries of Central Asia. Gini coefficients, increased from their 1995 levels in all countries, except in Kyrgyzstan, (Table 3). In Azerbaijan, for instance, the value of the Gini coefficient increased from 34.96 in 1995 to 36.5 in 2001. In Kazakhstan, the Gini coefficient was 35.32 in 1996 and came down to 31.3 in 2001 but it went up to 34.95 in 2000 and 33.91 in 2003. In Tajikistan, the Gini coefficient went up to 33.59 in 2004 from only 31.52 in 1999. Obviously, worsening income equality had a negative impact on the poverty situation in these countries.

[Table 3 here.]

Kyrgyzstan and Tajikistan are richly endowed with agricultural land. Reflecting this condition, their agricultural sectors account for sizeable shares of respective GDPs. For example, agriculture accounts for on average of about 39% of GDP in Kyrgyzstan in the period 1992-2006 and 28% of GDP in Tajikistan in the same period. Meanwhile, the share of industry in GDP in Azerbaijan and Kazakhstan is high, reflecting significant oil and gas deposits as well as large deposits of coal and many rare and precious metals, including gold (Bandara et al., 2004/05). However, in Kazakhstan, the largest sector is service which has contributed over 50% of GDP recently (Figure 3).

[Figure 3 here.]

V. Data

a. Data for Azerbaijan

The data for Azerbaijan are from the 1995 Azerbaijan Survey of Living Conditions (ASLC). This survey applies many of the features of LSMS surveys, developed by the World Bank, to provide data for assessing poverty. It covers all of the topics covered in most LSMS surveys but contains far fewer questions, and therefore, less detail. The survey includes questionnaires at the individual, household and population point (community) levels.

The survey covered a sample of 2016 households. Three separate populations were covered: households in Baku (capital), households outside of Baku and households of Displaced Persons (IDPs). The sample design included 408 households in Baku, 1200 households outside of Baku, and 408 households among Internally

Displaced Population. Within each of those populations, the sample was chosen in such a manner that each household had an equal probability of being selected. Weighting factors are provided to account for the difference between the population and sample distributions.

1.   South west from Baku, site of many displaced persons camps

2.   Far northwest

3.   Center north

4.   Naxichevan autonomous region, separated from the rest of Azerbaijan the southwest

5.   Far south along the coast of the Caspian and the Iranian border

6.   Near northwest from Baku

7.   Central region, near the occupied territory

8.   The Apsheron peninsula and other large urban areas

The poverty line is not available but the food-only poverty line is. The food-only poverty line used was developed by the government, based on an average daily intake of 2,360 calories (adjusted for age and gender). Thus, our analysis is based on food expenditure only.

b.   Data for Kazakhstan

The 1996 Kazakhstan Living Standard Measurement Survey of the World Bank (Kazakhstan LSMS) covered a sample of 1995 households. The survey presents five regions: the Central, the Southern, the Western, the Northern, and the Eastern; and three types of location: urban, poselki (villages of a city type) and rural. The poverty rate in 1996 is 34,6% at a government-defined subsistence minimum of Tenge (T) 2,861 per capita per month.

c.   Data for Kyrgyzstan

The data for Kyrgyzstan are from the 1998 Kyrgyz Poverty Monitoring Survey (KPMS). The 1998 KPMS has a large sample size of 2962 households. The KPMS surveys were carried out using a household questionnaire and a community (population point) questionnaire. The household questionnaires were used to collect demographic information on the composition of the household, housing, household

consumption including home production, as well as economic activities in agricultural and non-agricultural sectors. For each household member, individual level data on health, education, migration and labour was collected using household questionnaires. Community questionnaires were used to collect price data and the presence of social services and infrastructure in the community (population point) where the sampled household is located.

d. Data for Tajikistan

The data for Tajikistan are from the 2000 Tajikistan Living Standards Survey (TLSS) which was conducted jointly by the State Statistical Agency, the Center for Strategic Studies, the United Nations Development Programme (UNDP) and the World Bank (WB). The purpose of the survey is to provide data at the individual, household and community level for investigating issues of welfare and living standards of the population of the Republic of Tajikistan in 1999.

The 2000 TLSS contained 2,000 households with14,142 individuals. Households were randomly selected over 125 population points, which were stratified across urban and rural areas within oblasts, to ensure a nationally representative sample. In the first stage 125 primary sample units (PSU) were selected with the probability of selection within strata being proportional to size. At the second stage, 16 households were selected within each PSU, with each household in the area having the same probability of being chosen. The two- stage procedure has the advantage that it provides a self-weighted sample.

VI. Determinants of vulnerability in Central Asia

Based on the specification described in Section III, we estimated the coefficients on the different determinants of the ex ante mean and variance of future consumption as specified by (1) and (2). The estimated results, i.e. the relative importance of different factors to vulnerability, are also presented in the paper in Tables 4 to 7.

[Tables 4 to 7 here.]

e.   Location

In contrast to Kazakhstan and Tajikistan, urban households in Azerbaijan and Kyrgyzstan tend to have significantly higher expectation of future consumption (per capita) compared with rural households. However, there is no clear evidence of whether households in urban areas have a lower variance of consumption and urban households could have a higher variance of consumption.

In Kazakhstan, strikingly, households in urban areas tend to have lower expectation of future consumption compared with households in rural areas. However, they have a significantly smaller variance of consumption than rural households. Thus, there is not a clear effect of areas on vulnerability in Kazakhstan.

f.   Household size

Controlling for all other determinants,large household size tend to reduce the household future consumption, thereby increasing household vulnerability in Central Asia. It is well-known that families with many children are on average poorer. However, this negative effect weakens with the household size because the coefficient on size squared is positive and significant. At the same time, we find that, except in Kazakhstan, larger family size is associated with a significant decrease in the variance of consumption.

In Kyrgyzstan, and in contrast with consumption, larger household size tends to increase the household income. However, this positive effect weakens with the household size because the coefficient on size squared is negative and significant.

g.   Household head

We find that head of a household has an important role in determining the household vulnerability.

After controlling for all other characteristics, female headed households are associated with significantly higher mean of future consumption in the Central Asia countries.

We don't find a clear effect of age of household head on household vulnerability. For instance, in Azerbaijan and Kazakhstan a household with older head tends to have a significantly lower expectation of future consumption. In contrast, in Kyrgyzstan, a household with older head has a significant and higher expectation of future income and food consumption. However, this effect is not significant for total consumption in Kyrgyzstan and Tajikistan.

Our results also confirm that enhanced education of household head significantly reduces the household's vulnerability by increasing expectation of future consumption, but its effect on the variability of consumption is not statically significant.

We also model the effect of ethnicity of household head on the household vulnerability in Kyrgyzstan. In Kyrgyzstan, households with heads who are Russian have a significantly higher expectation of income and lower variance of total and food consumption and households with heads who are Kyrgyz have significantly lower expectation of total and food expenditure. However, we don't find a significant evidence of the impact of ethnicity on consumption and income in Tajikistan.

h. Dependence ratio

In general, we find that the larger is the dependency ratio, the larger is the household's vulnerability, as manifested by a significantly lower expectation of future consumption. Normally, the dependency ratio is represented by the proportions of children under 16 age and over 60. The effects of these two constituents of the dependence ratio are different across the countries. For example, in Azerbaijan, the effect of the proportion of children on household expectation of future consumption is less than that of proportion of old. The opposite result holds for Kazakhstan.

i. Unemployment

Although over the past several years the Central Asia countries have enjoyed strong economic growth, they still face problem of unemployment (ESCAP, 2004). Indeed, we find that in Azerbaijan households the greater the proportion of income earners in the household tend to have a higher expectation of future consumption. Unemployment in Central Asia may be due to the slow speed of privatization and

creation of SMEs, as well as because of the lack of reform and dynamism in the agricultural sector. The problems of unemployment were compounded by low unemployment benefits and inadequate employment and training services.

j. Assets

Obviously, possession of assets leads to an increase in the expectation of future consumption. First, assets like land or agriculture properties provide a means for household to obtain income, thereby increasing consumption, on average. In addition, assets provide a secure source of income in the face of negative shocks to income.

We find a (positive) effect of land ownership or using on household vulnerability. In Azerbaijan, Kazakhstan, and Tajikistan, ownership of land has a significant and sizable effect on mean of future consumption. However, we don't find significant impact of house ownership on vulnerability in Kazakhstan. This may be due to the fact that a household cannot sell their house to reduce income shocks but can sell land and other properties. In Kyrgyzstan, per capita land areas available to household also significantly increases household mean of future income and food expenditure.

Beside land, agriculture property and durable goods are also considered as assets. Our results confirm that in Azerbaijan agricultural property per capita reduces household vulnerability by increasing expectation of consumption. In Kazakhstan, value of durables also has a positive and significant effect on mean and negative effect on variance of future consumption, so reduces household's vulnerability. In Tajikistan, the possession of yak(s) also has mean enhancing effect on future consumptions (total and food).

k. Infrastructure

For Kazakhstan, our results confirm that the public transport reduces household vulnerability by increasing their average consumption. This result can be explained that public transport helps farmers deliver their goods to urban markets better.

VI. Profiles of vulnerability in the Central Asia countries

a. Distribution of vulnerability at the aggregate level

Based on the estimation results above we conduct a vulnerability profile for the Central Asia countries. By the crucial assumption that consumption is lognormally distributed we can calculate the probability of each household's consumption falling below the poverty line in the future. A household is then considered as vulnerable to poverty if this probability exceeds some threshold.

To investigate the distribution of the vulnerability we chose a threshold of 0.5 for the reason that a household whose vulnerability level exceeds 0.5 is more likely than not to end up poor (Chaudhuri, 2003; Chaudhuri et al., 2002).

Table 8 describes the distribution of vulnerability at the aggregate level in the Central Asian countries. Tajikistan is not only the poorest but also the most vulnerable to poverty country among these countries. The vulnerability rate in this country is even higher than the poverty rate as nearly 100% of the population are vulnerable to poverty. Thus, 100% of the poor in Tajikistan are expected to continue poor in the future.

The table shows that there is a sizable fraction of non-poor are vulnerable to poverty. For example, in Kazakhstan, of the 65% of the population observed to be non-poor, 13.4% are estimated to be vulnerable to poverty. Similarly, in Kyrgyzstan, of the 43.7% of the population observed to be non-poor, 46.1% are estimated to be vulnerable to poverty. In Azerbaijan, up to 70.5% of the non-poor area estimated to remain poor in the future. Thus poverty reduction strategies in Central Asia 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 8 here.]

To check for other vulnerability threshold, Figure 4 depicts the Kazakhstan estimated incidence of vulnerability to poverty for the population, the poor and the non-poor for given vulnerability thresholds - ranging from 0 to 1 – measured along

the horizontal axis. The horizontal line depicts the (observed) poverty rate of the population. The figure shows that for any threshold less than 0.45 the vulnerability rate of the population is higher than the poverty rate. The figure also suggests that for almost any threshold, the incidence of vulnerability to poverty of the population, the poor and the non-poor are significantly different and a non-zero fraction of the non-poor are vulnerable to poverty. The fraction of the non-poor that is vulnerable is much closer to the vulnerable fraction of the population than the vulnerable fraction of the poor. This implies that the incidence of vulnerability of the poor is much higher than that of the overall population.

[Figure 4 here]

b. *Distribution of vulnerability over selected segments*

Now we analyse the distribution of vulnerability (along with poverty) over locations and selected household and community characteristics. Except Tajikistan, of which nearly 100% of the population are poor and vulnerable poor, we find some interesting patterns of poverty and vulnerability distribution over selected segments of the population in the Central Asia countries.

Distribution of vulnerability over locations

In general, vulnerability (and poverty) in Central Asia is a rural phenomenon. Except in Azerbaijan, in all the Central Asia countries, relative to their share in the population, rural households are over-represented among the poor and the vulnerability (Tables 9 to 12). For instance, in Kazakhstan, while 42.4% of the population live in rural areas, 48.8% of the poor and 53.2% of the vulnerable are rural. Similarly, in Kyrgyzstan, while 74.5% of the population are rural, 80.5% of the poor live in rural areas as do 82.9% of those we estimate to be vulnerable.

[Tables 9 to 12 here.]

The disproportionate distribution of rural households to overall poverty and vulnerability leads to the higher poverty and vulnerability rates in rural areas. In Kazakhstan, 40.3% and 35.5% of the rural population are poor and vulnerable, whereas in urban areas, the poverty and vulnerability rates are only 30.3% and 20.3%

respectively. Similarly, in Kyrgyzstan, the poverty and vulnerability rates in rural areas are 60.8% and 69.7% respectively, compared with only 43.2% and 42.1% respectively in urban areas.

One of reasons explaining why the poverty and vulnerability in rural areas are more serious than in urban areas is the presence of high inequality. In Azerbaijan, strikingly, the poverty and vulnerability rates both are the highest in the capital Baku. This can be explained by two reasons. First, inequality in Baku is more severe than in the other areas. Second, food expenditure per capita in Baku is much lower than that in the other areas. While inequality in rural areas is roughly comparable to that for urban areas in Azerbaijan, the Lorenz curves for Kazakhstan (Figures 5 and 6) show that inequality in rural areas is more severe than in urban areas.

[Figures 5 and 6 here.]

However, inequality is not an important reason for poverty and vulnerability in Kyrgyz rural areas. Indeed, the Lorenz curve for this country (Figure 7) shows that inequality in urban areas is more severe than in rural areas. Inequality in rural areas of Tajikistan is roughly comparable to that in urban areas (Figure 8).

[Figures 7 and 8 here.]

Figures 9 to 11 show consumption averages for various regions.

[Figures 9 to 11 here.]

Distribution of vulnerability over regions

Now, the imbalances in the contribution of rural and urban areas to overall poverty and vulnerability are reproduced at the regional level. We find that the distribution of vulnerability also different across regions of the Central Asia countries.

We find that in Kazakhstan inter-regional differences in vulnerability rates are more obvious than the regional disparities in poverty rates. 0 shows that the fraction of population poor ranges from a low of 9.2% in the Northern region to a high of 69.1% in the Southern region. Meanwhile, the fraction of population vulnerable to

poverty ranges from a low of 0.9% in the Northern region to a high of 83.1% in the Southern region.

Figure 12 compares the poverty rates and vulnerability rates across oblasts in Kazakhstan . We find that only in several oblasts the population fraction that is vulnerable is more than the fraction that is poor. The figure also suggests that there are several oblasts with roughly similar poverty rates but having very different vulnerability rates. For example, in both Shezkazkanskaya and Karagandinskaya, about 32% of their population are poor. However, more than a half of the Shezkazkanskaya population are vulnerable to poverty and only 15% of the Karagandinskaya are vulnerable to poverty.

[Figure 12 here.]

<u>Distribution of vulnerability over household size</u>

In Azerbaijan and Kyrgyzstan the poverty and vulnerability increase the greater the number of household member. For instance, in Azerbaijan, of the 22.6% of the population who lives in households with 5 members – the latter accounting for 22.5% of the poor and 24.3% of the vulnerable – 67.2% are poor and 90.7% are vulnerable to poverty. Even worse, of the 47.6% of the population which lives in households with 6 members or more and, account for 55% of the poor and vulnerable, 78.1% are poor and nearly 100% are vulnerable to poverty.

Similarly, in Kazakhstan, of the 23% of the population which lives in households with more than 5 members, the latter accounting for upto 40.7% of the poor and 55.1% of the vulnerable, 62% are poor and 67.7% are vulnerable to poverty. Household size is one of reasons for the imbalances in the contributions of rural and urban areas to overall poverty and vulnerability because rural areas constitute about 66% of households with more than 5 members.

In Kyrgyzstan, strikingly, poverty and vulnerability decrease with larger household size.. For example, of the 1.3% of the population which lives in households with only one member, the latter accounting for 2.2% of the poor and 2.1% of the vulnerable, 94.2% are poor and 100% are vulnerable to poverty. Meanwhile, of the

55.1% of the population which lives in households with 6 members or more, the latter accounting for 52.1% of the poor and 48.4% of the vulnerable, only about a half are poor and vulnerable to poverty. Household size is one of the reasons for the imbalances in the contributions of rural and urban areas to overall poverty and vulnerability in Kyrgyzstan essentially because rural areas contribute about 66% of households with more than 5 members.

Distribution of vulnerability over gender

In Kyrgyzstan, of the 21.8% of the population which lives in households with female heads, the latter accounting for 24.5% of the poor and 26.1% of the vulnerable, 63.3% are poor and 74.9% are vulnerable to poverty. Meanwhile, of the 77.3% of the population which lives in households with male heads, the latter accounting for 74.7% of the poor and 72.5% of the vulnerable, 54.5% are poor and 58.7% are vulnerable to poverty. This is consistent with the estimated results of determinants of vulnerability in Kyrgyzstan where, controlling for all other characteristics, female headed households are associated with significantly higher mean of future consumption.

In Kazakhstan, of the 30.9% of the population which lives in households with female heads, the latter accounting for 24.8% of the poor and 23.3% of the vulnerable, 28.1% are poor and 21.3% are vulnerable to poverty. Surprisingly, the poverty vulnerability rates among households headed by women are significantly lower than those of households headed by men, at 38.1% and 31.3% respectively. The reason is the relation between gender of household head and rural area. About 70% of households headed by woman live in urban areas.

Distribution of vulnerability over education and occupation

In Kazakhstan, we find that people who live in households headed by individuals having lower education are poorer and more vulnerable to poverty. Of the 28% of the population that lives in households headed by individuals with no training (except the school one) – who comprise 36.4% of the poor and 42.5% of the

vulnerable – about 45% are poor and 43% are vulnerable to poverty. Meanwhile, of the 17.2% of the population that lives in households headed by individuals with at most occupational course 38.5% are poor and 30.4% are vulnerable, slightly lower than that of the previous group. The poverty and vulnerability rates are improved moderately for the population that lives in households headed by individuals with higher than occupational training. However, the drop in the incidence of poverty and vulnerability is not clear among the group headed by individuals whit higher than occupational training. For example, of the population that lives in households headed by individuals with at most bachelor degree 24.3% are poor and 20.9% are vulnerable to poverty. However, those fractions of population that lives in households headed by individuals with post-graduate degree are higher at 31.6% and 21.1% respectively.

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Distribution of vulnerability over community condition

In Kazakhstan, the availability of public transport which is one of community characteristics is clearly associated with lower levels of poverty and vulnerability. Of the population that lives in areas where public transport goes through 34.2% are poor and 25.8% are vulnerable to poverty. Meanwhile these fraction for the population that lives in areas where public transport doesn't go through are 40% and 42.4%.

VII.   Conclusions

In their transition to market-based economies since independence, Central Asian countries initiated macroeconomic reforms. This led to economic recovery and greater price stability. However, these countries are still challenged by poverty and vulnerability to poverty. Income equality is one of reasons constraining the poverty reduction, especially in rural areas. Therefore, these countries need to continue progress towards a full market economy and at the same prevent deterioration in income inequality.

The fraction of the population that faces risk of poverty is considerably different from the fraction that is observed to be poor. Thus poverty reduction strategies in these Central Asia countries need to incorporate not just alleviation efforts but also prevention. Of course, programs that aim to reduce the vulnerability in the population need to be targeted differently from those aimed at poverty alleviation. Because there is a sizable fraction of the population in the Central Asia countries which was observed to be non-poor but estimated to be vulnerable to poverty. Moreover, the distribution of vulnerability across different segments of the population can differ significantly from the distribution of poverty.

Figure 1: GDP growth in countries of Central Asia, 1986-2006 *(Source: World Development Indicators)*
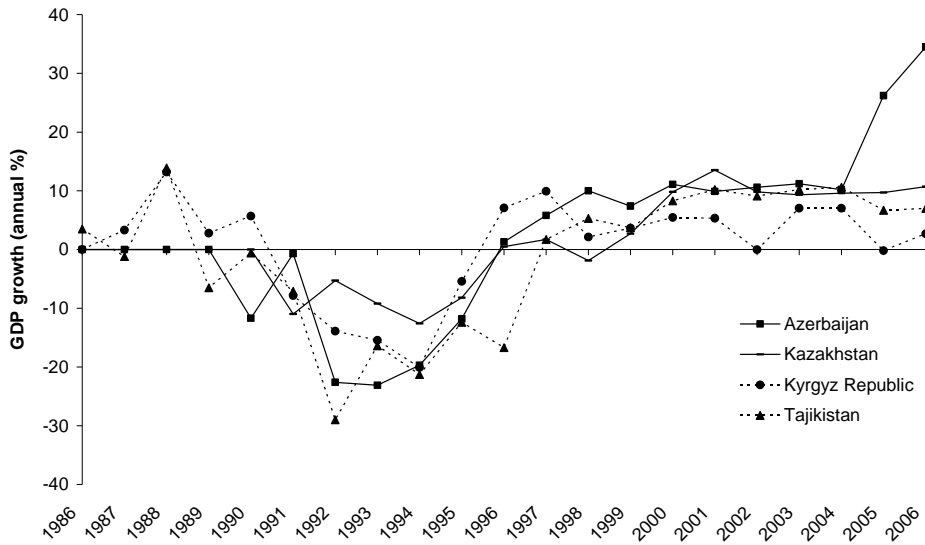
Figure 2: Inflation in countries of Central Asia, 1986-2006 *(Source: World Development Indicators)*
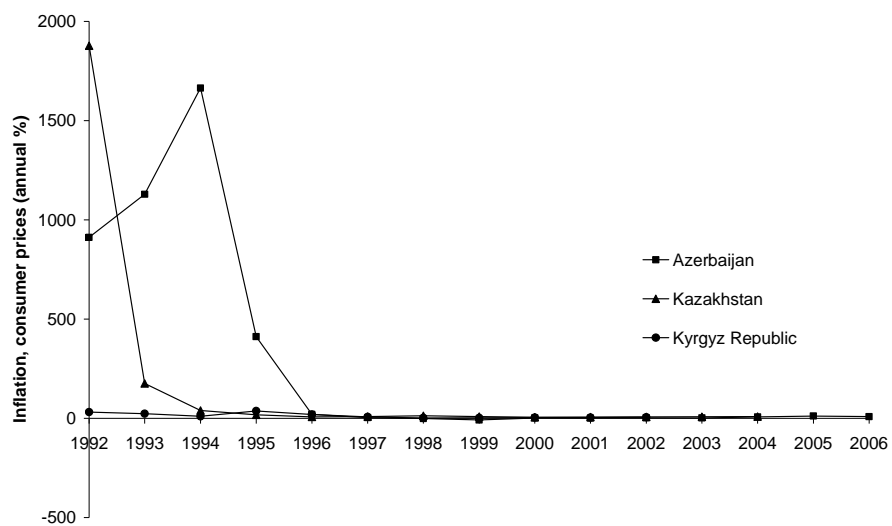
Figure 3: Economic structure of countries of Central Asia, 1992-2006

Azerbaijan

Kazakhstan

26
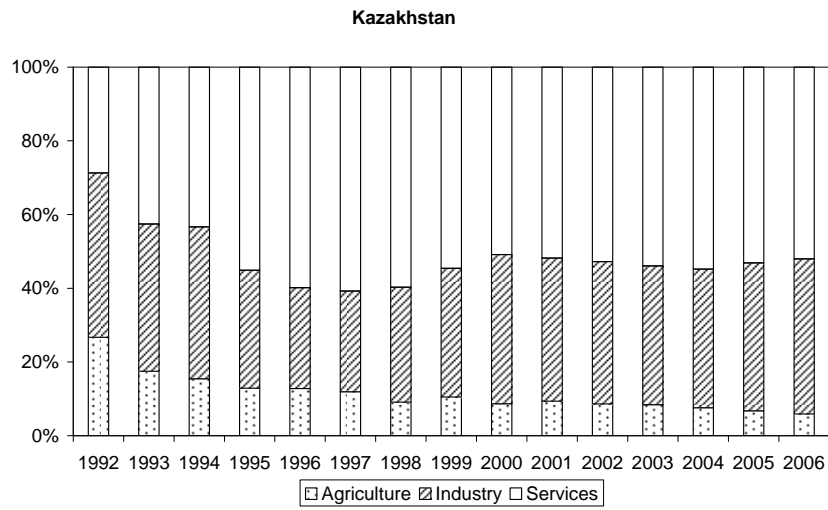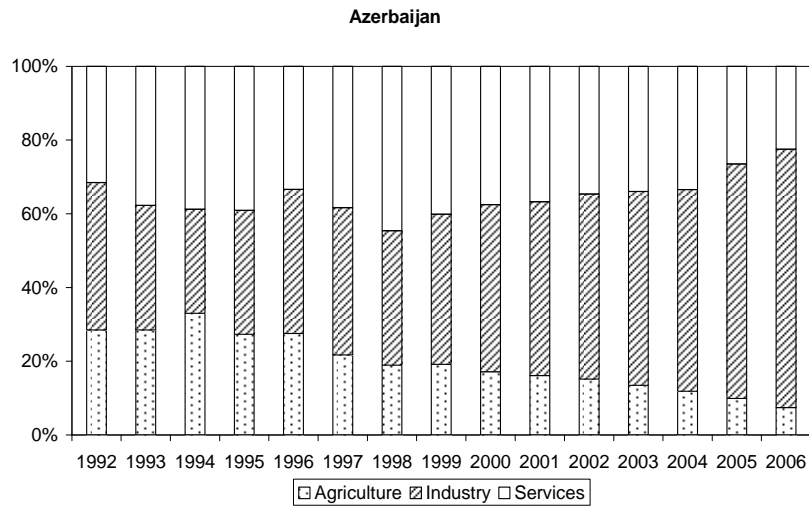
Kyzykstan
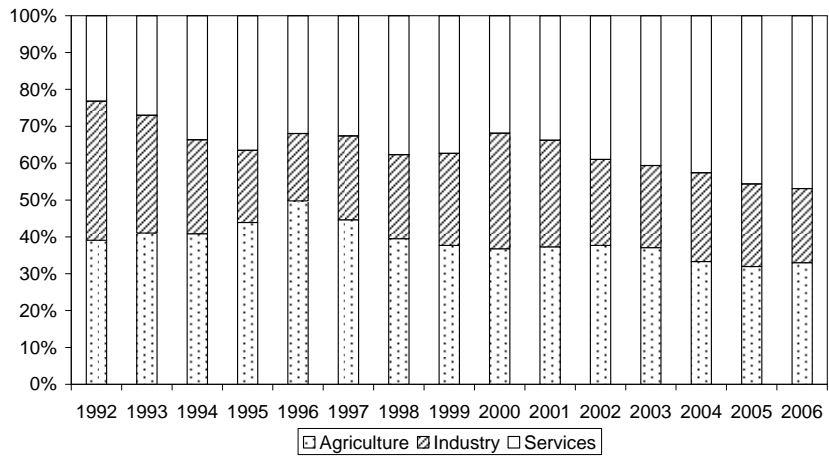
Tajikistan
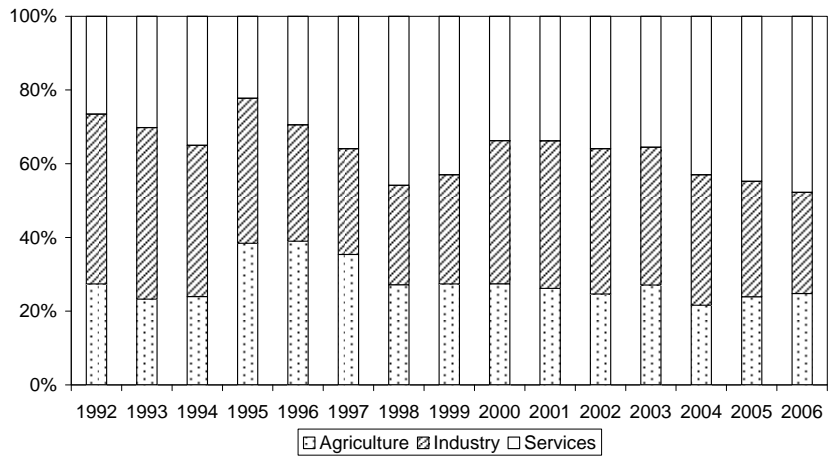
Figure 4: Estimated incidences of vulnerability to poverty for poor and non-poor in Kazakhstan
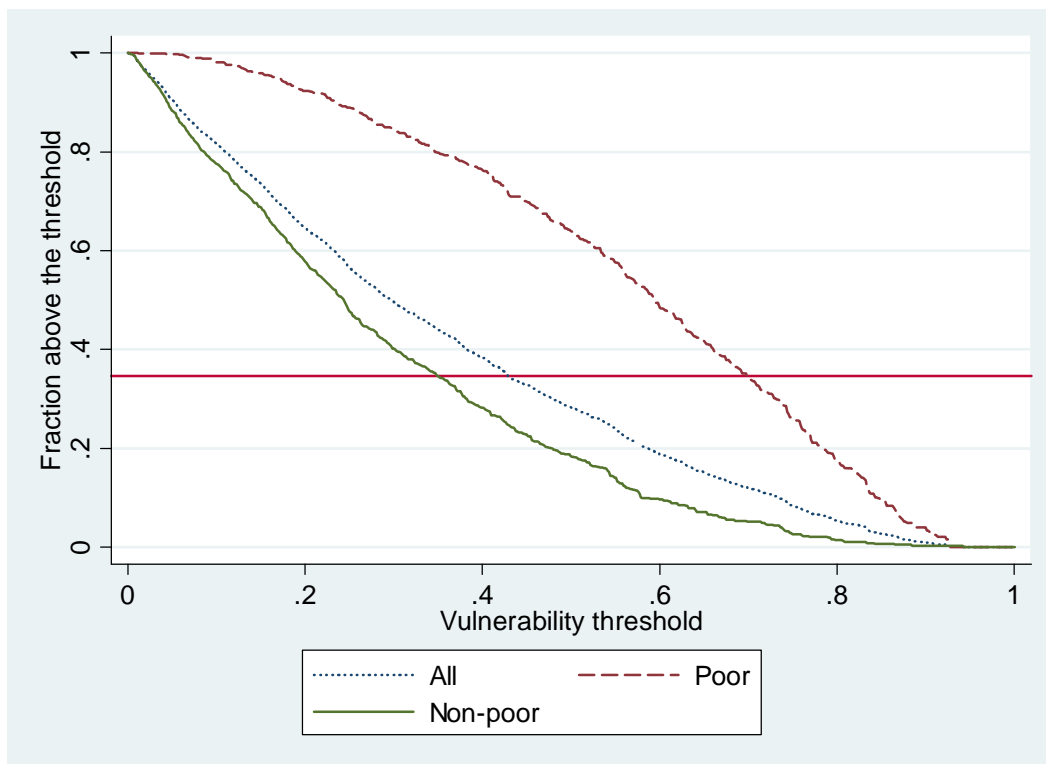
Figure 5: Lorenz food expenditure curves by area in Azerbaijan
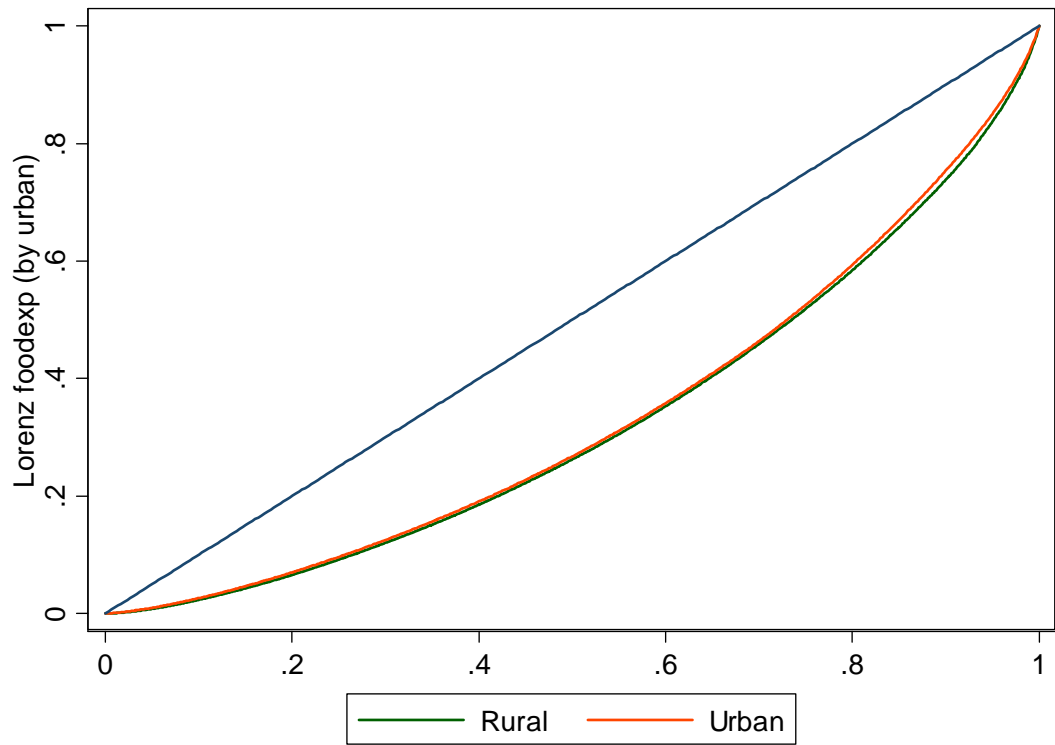
Figure 6: Lorenz consumption curves by areas in Kazakhstan
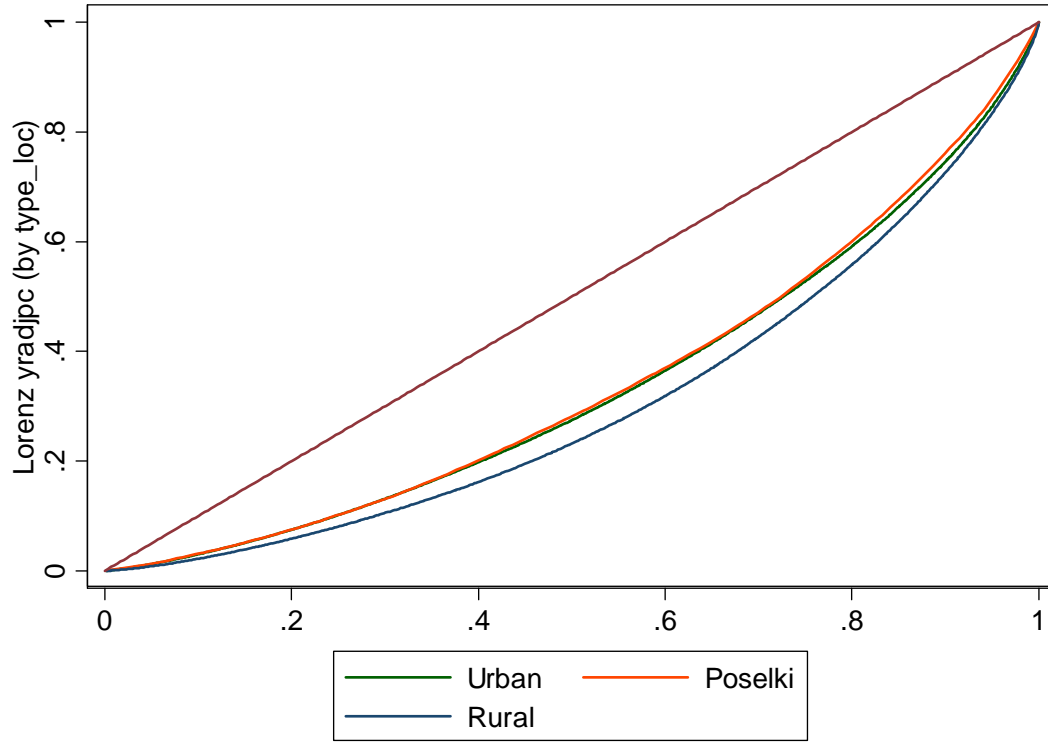
Figure 7: Lorenz total expenditure curves by area in Kyrgyzstan
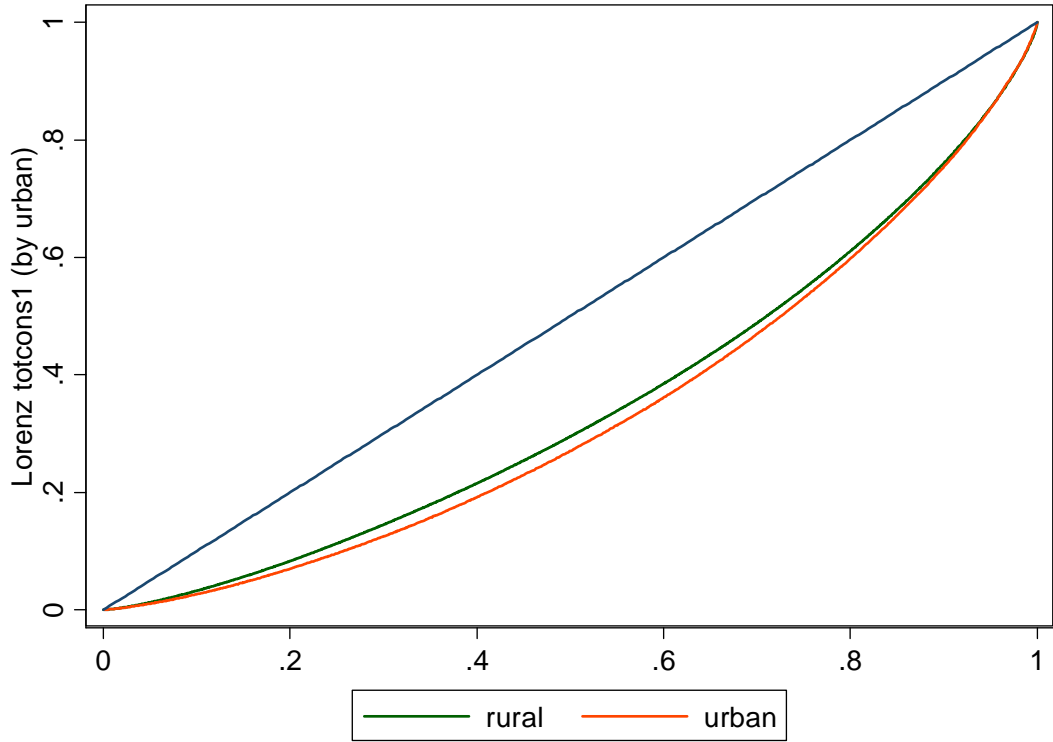
Figure 8: Lorenz total expenditure curves by area in Tajikistan
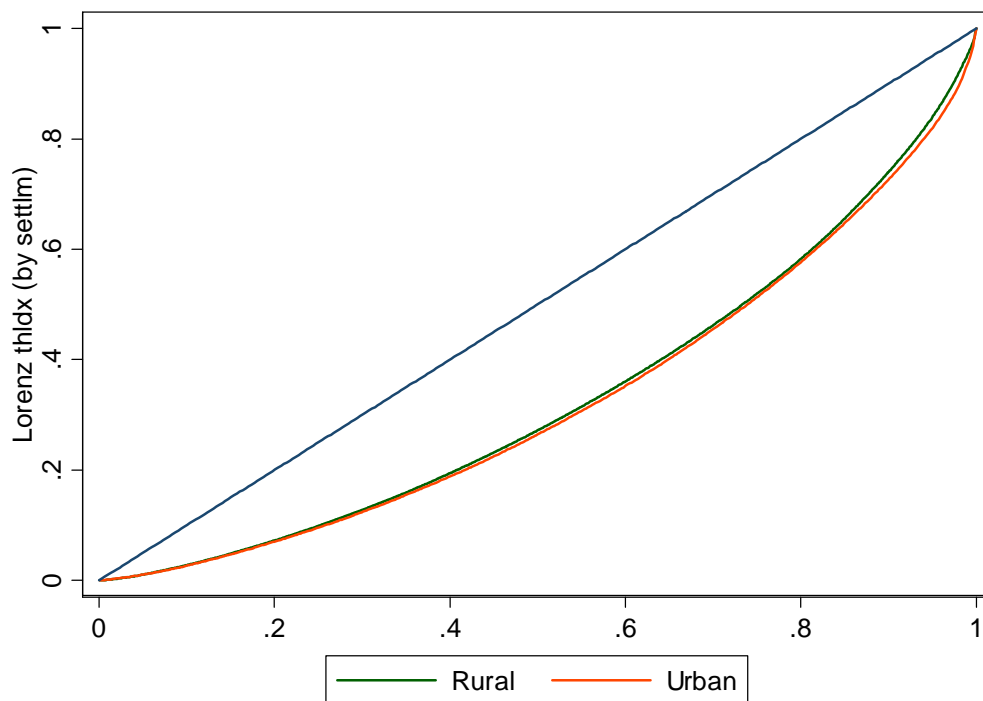
Figure 9: Monthly food expenditure per capita by areas in Azerbaijan
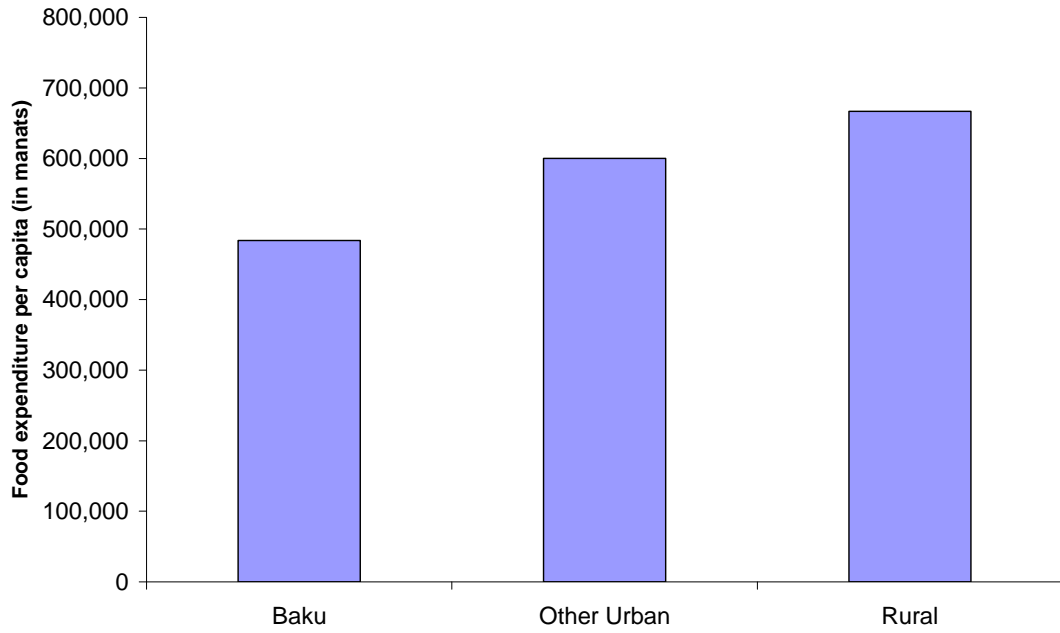
Figure 10: Annual consumption per capita by areas in Kazakhstan
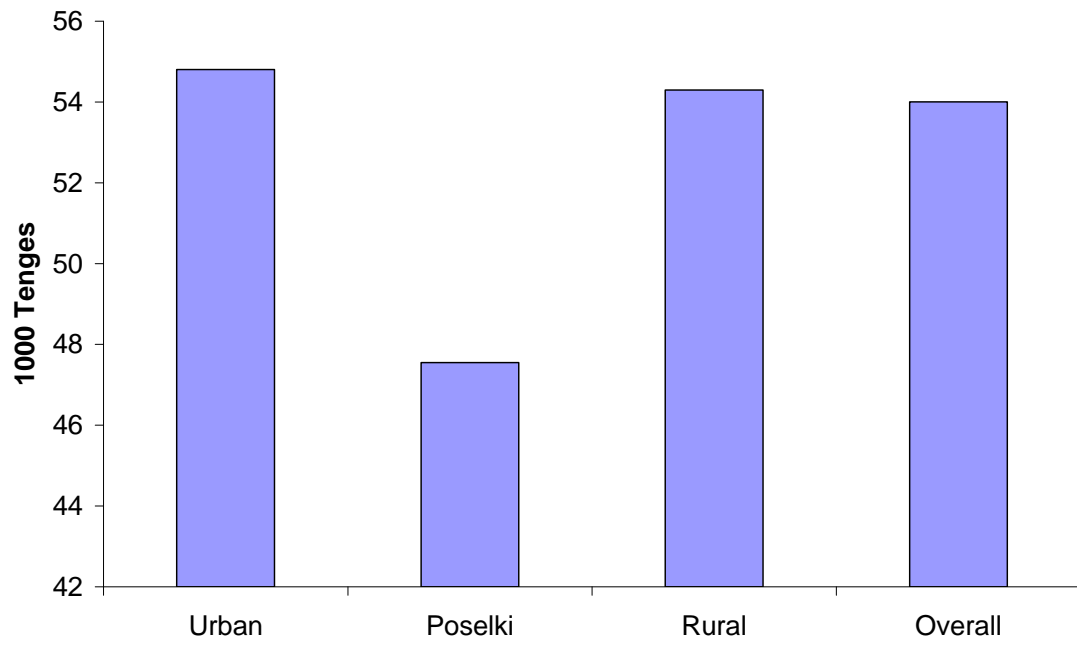
Figure 11: Monthly food expenditure per capita by area in Kyrgyzstan
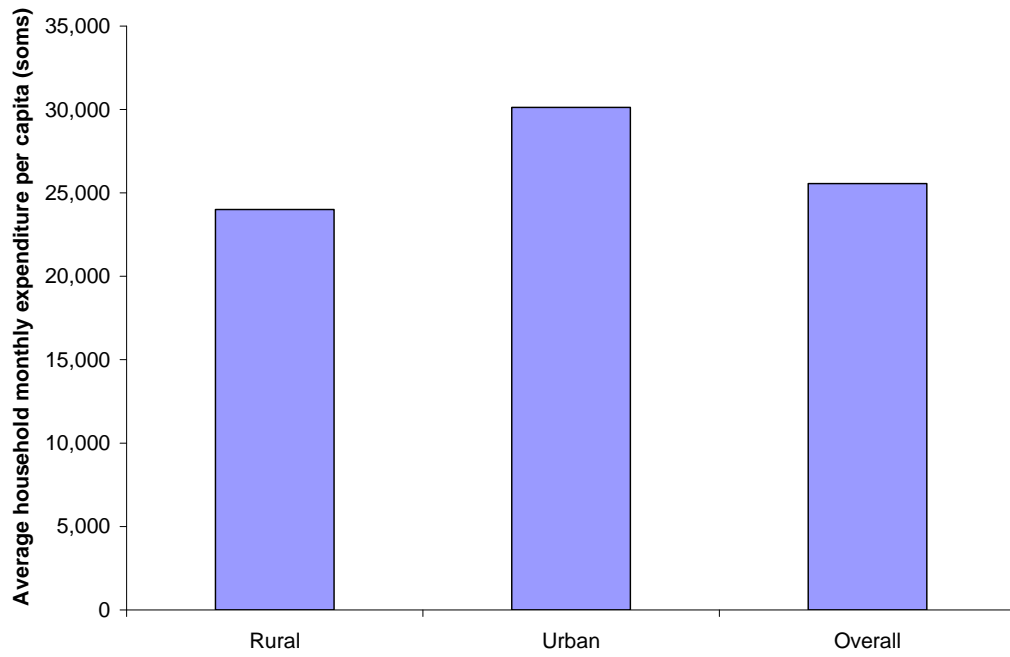
Figure 12: Poverty and vulnerability rates for oblasts of Kazakhstan
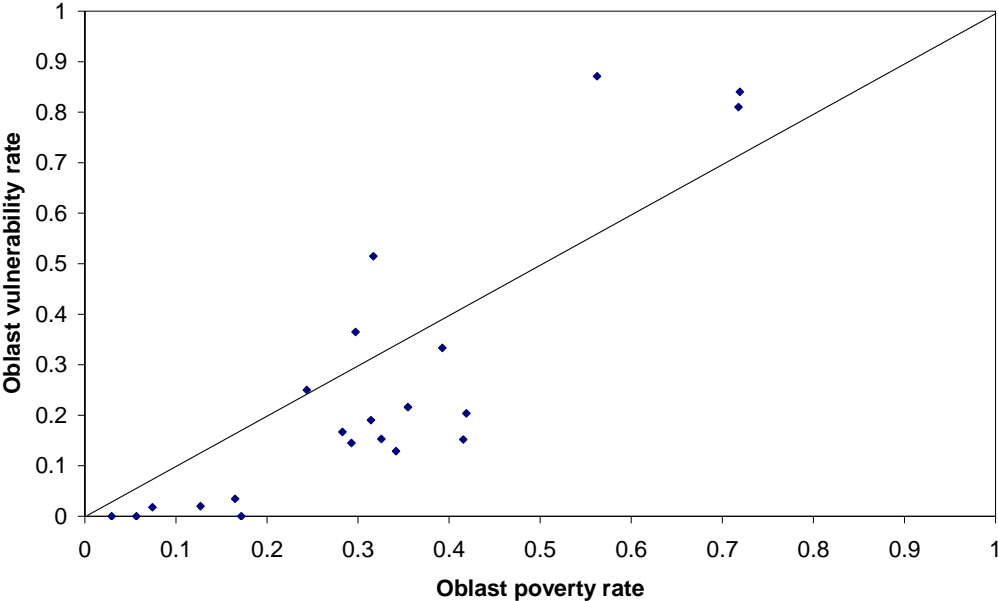
Table 1: Select development indicators in four countries of Central Asia, 2006

	GDP per capita (constant 2000 US$)	GDP growth (annual %)	Life expectancy at birth (years)	Population growth (annual %)	Urban population (% of total)
Azerbaijan	1,571	34.5	72.3	1.1	51.6
Kazakhstan	2,166	10.7	66.2	1.1	57.6
Kyrgyz Republic	326	2.7	67.7	0.9	36.0
Tajikistan	247	7.0	66.5	1.4	24.6

Source: World Development Indicators (The World Bank)

Table 2: Percentage of the population below the national poverty line in select countries of Central Asia, 1995-2005

	1995	1996	1999	2001	2002	2003	2005
Azerbaijan	68	..	..	50	..	..	..
Kazakhstan	..	35	..	18	15	..	..
Kyrgyz Republic	..	..	..	48	..	50	43
Tajikistan	..	..	75	..	..	64[*]	62[**]

Source: World Development Indicators (The World Bank)

[*]State Statistics Committee of Tajikistan. [**]Our estimate.

Table 3: Gini coefficient in countries of Central Asia, 1995-2004

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Azerbaijan	34.96	..	..	..	..	..	36.5	..	..	..
Kazakhstan	..	35.32	..	..	..	..	31.3	34.95	33.91	..
Kyrgyz Republic	..	..	40.5	35.98	34.6	30.27	29.03	31.67	30.31	..
Tajikistan	..	..	..	..	31.52	..	..	..	32.63	33.59

Source: World Development Indicators (The World Bank)

Table 4: Determinants of vulnerability in Azerbaijan

	log hh total expenditure per capita		log hh food expenditure per capita	
	expectation	variance	expectation	variance
Regions				
Urban	0.086*	-0.035	0.124**	-0.180***
Rural				
Near southwest	0.247***	-0.061	0.352***	-0.235***
Far Northwest	0.308***	-0.152***	0.365***	-0.189***
Central North	-0.015	-0.191***	0.164**	-0.284***
Naxichevan	-0.275***	-0.193**	-0.155*	-0.289***
Far South	0.294***	-0.102	0.241***	-0.234***
Near Northwest	0.208***	-0.166**	0.191***	-0.245***
Household characteristics				
Household size	-0.145***	-0.057**	-0.188***	-0.032
Household size squared	0.005***	0.004**	0.008***	0.002
Whether household head is male	0.082**	0.019	0.089**	-0.019
Age of household head	-0.005***	0	-0.004***	0
Number of years household head spent on studying	0.005*	0.001	0.007**	0.002
Prop. members chronically ill during the last 4 weeks	-0.046	0.025	-0.04	0.06
Prop. of household members age 0-14	-0.185**	0.047	-0.161**	-0.025
Prop. of household members age >60	-0.229***	0.014	-0.152*	0.113
Prop. of members working for income	0.083**	-0.019	0.066**	-0.073**
Assets				
Whether household owns land	0.185***	-0.03	0.163***	-0.009
Agr. property per capita owned by hh (mil. Manats)	0.160***	0.012	0.188***	0.03
Constant	13.026***	0.575***	12.118***	0.498***
No. of obs	2016	2016	2016	2016
R-squared	0.179	0.02202	0.1847	0.0205

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

Table 5: Determinants of vulnerability in Kazakhstan

	Log total consumption per capita	
	expectation	variance
Areas		
Urban	-0.129***	-0.047*
Poselki	-0.168***	-0.086**
Regions		
Central	-0.042	0.084***
Southern	-0.420***	0.019
Western	0.099**	0.040
Northern	0.254***	-0.048
Household characteristics		
Household size	-0.223***	0.009
Household size squared	0.011***	-0.003
Age of household head	-0.004***	-0.001
Whether household head is male	0.051*	-0.016
Education degree of household head	0.024***	-0.006
Prop. of children (<=15)	-0.360***	0.080
Prop. of old (>=60)	-0.206***	-0.014
Prop. of members who have good or normal health	0.078*	0.004
Assets		
Whether household owns house	0.037	-0.048
Log total value of durables in the household	0.030***	-0.016***
Whether household has the use of any private plot	0.272***	-0.030
Community		
Whether public transport goes through	0.127***	0.004
Constant	11.052***	0.561***
Number of observations	1940	1941
R-squared	0.3625	0.03483

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

Table 6: Determinants of vulnerability in Kyrgyzstan

	log hh income per capita		log hh total expenditure per capita		log hh food expenditure per capita	
	expectation	variance	expectation	variance	expectation	variance
Areas						
North Urban	0.167***	-0.106	0.193***	0.070***	0.129***	0.100***
North Rural	-0.04	0.160**	0.007	0.109***	-0.076***	0.132***
South Urban	-0.212***	0.036	0.193***	-0.009	0.134***	-0.032
Household characteristics						
Household size	0.288***	0.022	-0.177***	-0.021*	-0.180***	-0.011
Household size squared	-0.012***	-0.002	0.006***	0.001	0.006***	0
Age household head	0.008***	-0.006***	0.001	-0.001	0.002**	-0.001
Whether hh head is male	0.134***	-0.082	0.089***	-0.029	0.096***	-0.029
Ethnic of household head						
Kyrgyz	-0.011	0.113	-0.250***	-0.107***	-0.287***	-0.079*
Russian	0.291***	-0.195	0.071	-0.148***	0.028	-0.159***
Ukrainian	0.143	-0.072	0.082	-0.177**	0.018	-0.203**
Uzbek	-0.260**	0.127	-0.443***	-0.081*	-0.435***	-0.054
Kazakh	-0.078	-0.175	0.02	-0.095	0.11	-0.026
Beylorussian	0.602**	-0.266	0.316	-0.277	0.152	-0.336
Tadjik	-0.639***	-0.258	-0.440***	-0.191*	-0.262	-0.124
Tatar	0.151	-0.231	0.006	0.006	0.001	0.009
Dungan	-0.041	-0.138	0.290**	-0.115	0.071	-0.094
Highest certification of hh head	0.045***	-0.041***	0.059***	0.005	0.042***	-0.004
Prop. of members age 0-14	-0.639***	-0.648***	-0.389***	-0.033	-0.278***	-0.039
Prop. of members age > 60	-0.362***	-0.402**	-0.327***	-0.073	-0.204***	-0.018
Assets						
Per capita land area available to hh	0.005**	-0.005*	0	-0.001	0.001*	0
Constant	6.358***	1.061***	9.306***	0.415***	8.802***	0.389***
Number of observations	2752	2794	2869	2869	2869	2869
R squared	0.2178	0.02836	0.4227	0.02821	0.4076	0.02888

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

Table 7: Determinants of vulnerability in Tajikistan

	log hh total consumption per capita		log hh food consumption per capita		log hh income per capita	
	expectation	variance	expectation	variance	expectation	variance
Location						
Whether household lives in urban area	0.014	0.011	-0.002	-0.004	-0.092	-0.275*
Dushanbe – capital	0.365***	0.02	0.307***	-0.023	0.273***	-0.006
GBAO	-0.203***	-0.03	-0.083	0.028	0.158	-0.342
RSS	0.297***	0.091**	0.271***	0.026	-0.114	0.468***
Leninabad	0.021	0.006	-0.005	-0.059*	-0.281***	0.183
Household characteristics						
Household size	-0.139***	-0.034**	-0.142***	-0.022	-0.121***	0.038
Household size squared	0.005***	0.001	0.005***	0.001	0.004***	-0.004
Age of household head	-0.001	-0.001	0.001	-0.001	-0.003	0.007
Whether household head is male	0.124***	-0.052	0.124***	-0.055	0.221***	0.091
Ethnicity of household head						
Tajik	0.179	-0.066	0.145	-0.111	0.056	-0.209
Russian	0.192	-0.129	0.219	-0.126	0.118	-0.164
Uzbek	0.142	-0.058	0.125	-0.093	0.128	-0.103
Tartar	-0.182	0.329	-0.111	0.301	0.102	0.529
Kyrgyz	0.133	-0.219	0.143	-0.253	-0.104	-0.451
Whether hh head obtained at least 8th class	0.017	-0.055*	0.03	-0.063**	0.089*	0.061
Prop. of members age 0-14	-0.483***	-0.061	-0.352***	-0.037	-0.639***	-0.027
Prop. of members age > 64	-0.371***	-0.073	-0.178	0.016	-0.128	-0.804
Prop. of member with poor health	-0.058	0.074	-0.201**	0.01	-0.305*	0.750*
Assets						
Whether household owns land	0.141***	-0.038	0.104**	-0.024	-0.186*	-0.057
Whether household owns yak(s)	1.103***	-0.234	1.185***	-0.2	0.823	-0.751
Constant	10.027***	0.643***	9.573***	0.587***	9.702***	0.576
Number of observations	1632	1633	1631	1632	1611	1614
R squared	0.1929	0.02251	0.2007	0.02126	.08998	.02209

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

Table 8: Cross-distribution between poverty and vulnerability in Central Asia

	Non-vulnerable to poverty	Vulnerable to poverty	
Azerbaijan	**15.8**	**84.2**	**100**
Non-poor	29.5	70.5	32.3
Poor	9.2	90.8	67.7
Kazakhstan	**71.8**	**28.2**	**100**
Non-poor	86.6	13.4	**65.0**
Poor	44.3	55.7	**35.0**
Kyrgyzstan	**37.4**	**62.6**	**100**
Non-poor	53.9	46.1	43.7
Poor	24.5	75.5	56.3
Tajikistan	**0.2**	**99.8**	**100**
Non-poor	3.2	96.8	**5.1**
Poor	0.0	100.0	**94.9**

Table 9: Distributions of poverty and vulnerability in Azerbaijan

	Share of population	Share of poor	Share of vulnerable	Poverty rate	Vulnerability rate
Overall	**100**	**100**	**100**	**67.7**	**84.2**
By areas and regions					
Rural	62.6	60.5	59.7	65.4	80.4
Near southwest	8.8	7.3	7.6	56.1	72.3
Far Northwest	15.3	13.0	11.7	57.6	64.3
Central North	7.4	6.9	7.0	62.8	80.0
Naxichevan	4.3	5.7	4.9	89.5	95.9
Far South	7.4	6.9	7.2	63.0	81.4
Near Northwest	7.2	7.1	7.2	66.8	84.9
Central	12.2	13.6	14.2	75.6	97.6
Urban	37.4	39.5	40.3	71.5	90.7
By household size					
1	1.1	0.5	0.1	32.3	7.1
2	3.7	1.9	0.7	34.1	16.2
3	7.7	5.1	4.4	44.8	48.7
4	17.3	15.1	15.4	59.1	74.9
5	22.6	22.5	24.3	67.2	90.7
6 and more	47.6	55.0	55.0	78.1	97.4
By gender of household head					
Female	18.0	18.1	17.8	68.3	83.5
Male	82.0	81.9	82.2	67.5	84.4
By possession of land					
Owns no land	49.1	52.5	53.2	72.3	91.2
Owns land	50.9	47.5	46.8	63.2	77.5

Table 10: Distributions of poverty and vulnerability in Kazakhstan

	Population share	Share of poor	Share of vulnerable	Poverty rate	Vulnerability rate
Overall	**100**	**100**	**100**	**35.0**	**28.2**
By areas					
Urban	49.5	42.8	35.6	30.3	20.3
Poselki	8.1	8.4	11.2	36.3	39.1
Rural	42.4	48.8	53.2	40.3	35.5
By regions					
Central	16.8	13.0	10.3	27.1	17.3
Southern	21.1	41.5	62.0	69.1	83.1
Western	14.0	15.4	10.9	38.4	22.0
Northern	20.6	5.4	0.7	9.2	0.9
Eastern	27.5	24.7	16.1	31.5	16.6
By household size					
1	2.6	0.9	0.4	12.6	3.8
2	10.6	6.2	2.1	20.5	5.7
3	17.1	11.1	5.9	22.9	9.8
4	27.4	18.4	14.0	23.5	14.4
5	19.4	22.6	22.5	41.0	32.8
6 and more	23.0	40.7	55.1	62.0	67.7
By gender of household head					
Female	30.9	24.8	23.3	28.1	21.3
Male	69.1	75.2	76.7	38.1	31.3
By education of household head					
No training	28.0	36.4	42.5	45.4	42.8
Occupational courses	17.2	18.9	18.5	38.5	30.4
PTU, FSO without sec. classes	5.6	5.3	4.1	33.1	20.8
PTU with sec. classes	9.8	8.5	7.8	30.6	22.5
Technical colleges	21.6	18.5	13.9	30.1	18.1
University	17.6	12.2	13.0	24.3	20.9
Post-graduate	0.3	0.2	0.2	31.6	21.1
By possession of house					
Owns no house	10.0	11.9	12.2	41.5	34.4
Owns house	90.0	88.1	87.8	34.3	27.5
By possession of land					
Owns no land	37.0	47.3	54.1	44.8	41.4
Owns land	63.0	52.7	45.9	29.3	20.5
By public transport					
No public transport goes through	14.8	17.0	22.3	40.0	42.4
Public transport goes through	85.2	83.0	77.7	34.2	25.8

Table 11: Distributions of poverty and vulnerability in Kyrgyzstan

	Share of population	Share of poor	Share of vulnerable	Poverty rate	Vulnerability rate
Overall	**100**	**100**	**100**	**56.3**	**62.6**
By areas					
Rural	74.5	80.5	82.9	60.8	69.7
Urban	25.5	19.5	17.1	43.2	42.1
By household size					
1	1.3	2.2	2.1	94.2	100.0
2	4.6	6.0	6.9	72.8	92.9
3	7.3	7.7	9.0	59.1	76.6
4	13.6	13.3	13.2	55.0	60.9
5	18.1	18.8	20.5	58.6	71.1
6 and more	55.1	52.1	48.4	53.3	55.0
By gender of household head					
Female	21.8	24.5	26.1	63.3	74.9
Male	77.3	74.7	72.5	54.5	58.7
By age of household head	0.0				
<20	0.3	0.5	0.4	87.5	90.0
20-40	36.1	38.2	41.4	59.6	71.8
40-60	39.5	34.0	30.9	48.5	49.0
>60	24.1	27.4	27.3	63.9	70.8
By ethnicity of household head					
Kyrgyz	72.3	76.0	78.7	59.2	68.2
Russian	13.1	9.9	7.7	42.5	36.9
Ukrainian	1.1	0.9	0.7	44.7	38.2
Uzbek	7.1	8.2	9.5	65.3	84.7
Kazakh	0.8	0.5	0.1	36.6	8.0
Beylorussian	0.1	0.0	0.0	15.4	15.4
Tadjik	0.4	0.5	0.5	68.6	88.2
Tatar	0.9	0.6	0.5	38.0	31.4
Dungan	0.8	0.2	0.0	16.8	0.0
Others		2.5	1.2	49.2	27.0
By education of household head					
No diploma or certificate	10.8	12.3	15.0	64.3	87.2
Incomplete secondary	14.5	15.9	15.7	61.7	68.1
Complete secondary	37.4	42.2	44.7	63.6	74.7
Prof-tech school	6.8	7.0	6.8	57.8	61.8
Technikum	14.9	12.7	10.6	47.9	44.8
Higher ed. diploma	14.3	8.6	6.8	34.0	29.9
Cand. of science	0.1	0.0	0.1	7.1	50.0
Doctor of science	0.0	0.0	0.0	0.0	100.0
Other	1.2	1.3	0.3	61.0	15.1

Table 12: Distributions of poverty and vulnerability in Tajikistan

	Share of population	Share of poor	Share of vulnerable	Poverty rate	Vulnerability rate
By areas					
Rural	69.8	70.7	69.9	96.1	99.9
Urban	30.2	29.3	30.1	92.2	99.6
By regions					
Dushanbe	9.3	8.4	9.2	85.4	98.7
GBAO	4.9	5.2	4.9	100.0	100.0
RSS	28.0	27.4	28.0	92.6	99.8
Leninabad	35.6	36.1	35.7	96.3	100.0
Khatlon	22.1	23.0	22.2	98.4	100.0
By household size					
1	0.3	0.2	0.3	80.0	100.0
2	1.3	1.0	1.2	76.4	90.9
3	3.3	2.7	3.3	77.9	100.0
4	7.1	6.8	7.1	90.8	100.0
5	14.5	14.3	14.5	94.0	100.0
6 and more	73.5	74.9	73.6	96.6	99.9
By gender of household head					
Female	17.6	17.5	17.6	94.4	100.0
Male	82.4	82.5	82.4	95.0	99.8
By ethnicity of household head					
Tajik	68.2	68.7	68.2	95.5	99.8
Russian	1.2	0.9	1.2	70.9	100.0
Uzbek	28.5	28.4	28.5	94.6	99.8
Tartar	0.5	0.5	0.5	88.6	100.0
Kyrgyz	1.1	1.2	1.1	100.0	100.0
Others	0.4	0.4	0.4	78.9	100.0
By qualification of household head					
None	38.2	38.2	38.2	94.7	99.8
8th (9th) class	11.7	11.8	11.7	96.2	100.0
Secondary school	32.9	32.8	32.9	94.7	99.9
Prof-tech. school	6.8	6.8	6.8	95.2	99.7
Spec tech school	4.6	4.5	4.5	94.6	99.5
Higher ed institute	5.3	5.2	5.3	93.7	99.6
Cand. of science	0.1	0.1	0.1	100.0	100.0
Others	0.5	0.5	0.5	100.0	100.0
By possession of land					
No land	92.3	92.5	92.3	95.1	99.8
Owning land	7.7	7.5	7.7	92.6	100.0

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