UNITED NATIONS UNIVERSITY
UNU-WIDER
World Institute for Development Economics Research

Research Paper No. 2008/26

Asset-Based Poverty in Rural Tajikistan

Who Climbs out and Who Falls in?

Oleksiy Ivaschenko and Cem Mete*

March 2008

Abstract

Tajikistan's rural sector has witnessed substantial development since the country began to emerge from civil conflict in 1999. Gross agricultural output increased 64 per cent from 1999 to 2003, and there were significant developments in the agricultural reform agenda. This paper uses the panel component of two surveys conducted in Tajikistan at one-year interval (2003 and 2004) to explore the major determinants of the transition out of/into poverty of rural households. Poverty status is measured in the asset space, thus indicating structural rather than transitory poverty movements. The empirical analysis reveals several interesting findings that are also important from a policy perspective: first, cotton farming seems to have no positive impact on poverty levels, nor on mobility out of poverty. Second, the rate of increase in the share of private farming at the district level had little impact on poverty levels and poverty mobility.

…/.

Keywords: welfare, poverty, Tajikistan

JEL classification: I3

* ECSHD, World Bank, Washington, DC: emails: oivaschenko@worldbank.org (O. Ivaschenko); cmete@worldbank.org (C. Mete)

This is a revised version of a paper originally prepared for the UNU-WIDER conference on Fragile States—Fragile Groups, directed by Mark McGillivray and Wim Naudé. The conference was jointly organized by UNU-WIDER and UN-DESA, with a financial contribution from the Finnish Ministry for Foreign Affairs.

UNU-WIDER gratefully acknowledges the contributions to its project on Fragility and Development from the Australian Agency for International Development (AusAID), the Finnish Ministry for Foreign Affairs, and the UK Department for International Development—DFID. Programme contributions are also received from the governments of Denmark (Royal Ministry of Foreign Affairs), Norway (Royal Ministry of Foreign Affairs) and Sweden (Swedish International Development Cooperation Agency—Sida).

ISSN 1810-2611 ISBN 978-92-9230-072-2

Third, there is strong evidence of geographic poverty mobility traps in Tajikistan. Higher levels of poverty in a district appear to reduce significantly the chance of a household shedding poverty. Living in a region with overall slow economic growth is also found to undermine the odds of exiting poverty and to increase the risk of falling into poverty. Finally, several key household-level factors, such as the share of adults, education level, health status and participation in wage employment, also emerge as significant predictors of poverty mobility.

Authors notes

The findings, interpretations, and conclusions expressed herein are those of the author(s) and do not necessarily reflect the views of the International Bank for Reconstruction and Development/the World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

UNU World Institute for Development Economics Research (UNU-WIDER)
Katajanokanlaituri 6 B, 00160 Helsinki, Finland

Typescript prepared by Liisa Roponen at UNU-WIDER

1 Introduction

This paper exploits an asset-based approach to study the (asset-based) poverty dynamics of Tajikistan rural households. We use a panel of rural households that have been observed during two time periods: June-July 2003 and July-November 2004.

Analysing the dynamics of rural poverty in Tajikistan during this time period is particularly interesting in view of the drastic changes that have occurred in the country over the last several years. Emerging in 1999 from civil war and a prolonged period of economic collapse,[1] the country's economic performance has been impressive from the year 2000, with sustained real GDP annual growth rates of 7 to 9 per cent.[2]

Economic growth has been accompanied with substantial reduction in poverty, dropping from 81 per cent of the population living below the poverty line (US$2.15 per day) in 1999 to 64 per cent in 2003 (World Bank 2006). Although poverty headcount fell during this period by 19 percentage points in the rural areas compared to 14 percentage points in urban centres, it remains higher in the rural regions: 65 per cent versus 59 per cent. As 73 per cent of the population live in the countryside, poverty in Tajikistan continues to be an overwhelmingly rural phenomenon. Economic growth and the resultant poverty reduction are explained by three major factors: (i) conflict cessation, which allowed economic activity to resume and markets to develop; (ii) initial impact of the macroeconomic stability and agricultural reforms in the non-cotton sector that enabled farmers to diversify production and increase productivity; and (iii) large increase in migrant workers exiting Tajikistan for Russia and other countries. However, there have been concerns that once the initial benefits of these 'special' factors dry out, Tajikistan's poverty reduction trends may not be sustainable (World Bank 2006).

In view of the sound economic growth rates, markedly reduced but still very high rural poverty, and concerns over the sustainability of the country's poverty reduction trend, it is important from a policy perspective to understand the key factors at the micro (household/community) level that explain the transition of rural households in and out of poverty. This is the main objective of this paper.

The paper contributes to the literature on welfare dynamics in general, and to the studies of poverty in Tajikistan in particular on several fronts:

i) utilizing an assets-based approach to better capture the permanent (as opposed to transitory) component of welfare changes for rural households;

ii) investigating explicitly the importance of community/local factors versus household/individual level characteristics to explain movements in and out of (asset-based) poverty.

It is worth noting that a study of the general factors affecting poverty transition in Tajikistan has been undertaken by Angel-Urdinola, Mete and Cnobloch (2008). Our

---

1 Looking at cotton output across *rayons* (the smallest administrative unit), we observe that between 1991 and 1999, there was an average output decline of 62 per cent. Cotton output has increased since 1999 by an average of 91 per cent, but still remains at about 66 per cent of its 1991 level.

2 Despite solid growth rates, Tajikistan's per capita GDP in 2004 was still merely US$225, making it the poorest country in the Europe and Central Asia region.

study expands on this work by focusing specifically at the determinants of welfare dynamics in rural areas. More specifically, we combine household survey data with district (*rayon*) level data to take into account the poverty impact of community-level factors such as the share of private (*dekhan*) farms, per hectare of land under cotton cultivation, level of debt and distance to market or district centre.[3]

The paper is structured as follows. Section 2 discusses the main developments in Tajikistan's rural sector since 1999, as well as the correlates of rural poverty at the district (*rayon*) level. Section 3 provides the theoretical and empirical framework for the analysis of the (asset-based) poverty mobility at the household level. It also describes the data and the constructed asset index. Section 4 presents the empirical results, and section 5 concludes with a summary of the main findings and their policy implications.

2 Tajikistan's rural sector developments since 1999, and correlates of rural poverty at the district (*rayon*) level

2.1 Rural sector developments since 1999

Tajikistan's rural sector has witnessed substantial changes since the country emerged from civil conflict in 1999. These include agricultural reform, and specifically the rapidly changing structure of land ownership; significant output growth due to increased yields; and unfavourable developments in the price of cotton, the dominant cash crop of Tajikistan.

In terms of the ownership structure, the country's agricultural sector had been fairly unreformed until the late-1990s, but experienced considerable transformation thereafter. In 2000, the agricultural sector was still dominated by the old state-farms inherited from the soviet system.[4] These farms accounted for more than 60 per cent of the arable land (Figure 1) but contributed only about 30 per cent of the total agricultural sector output because of low efficiency (Figure 2). The ownership structure changed radically during 1999-2004, as old state-farms were dismantled and private ownership *dekhan* farms were created.[5] As a result, the share of land cultivated by the state-farms declined to approximately 30 per cent, while that cultivated by the newly created *dekhan*s increased to almost 50 per cent (Figure 1). A fourfold increase in the output of the *dekhans* during 1999-2003 raised their contribution to sector output from 10 to 24 per cent. The share of

---

3 Angel-Urdinola, Mete and Cnobloch (2008) differentiate between urban and rural areas by including an urban/rural dummy in their regression that uses combined (urban and rural) panel sample, and thus they make no attempt to analyse welfare dynamics determinants that would be specific to the rural areas.

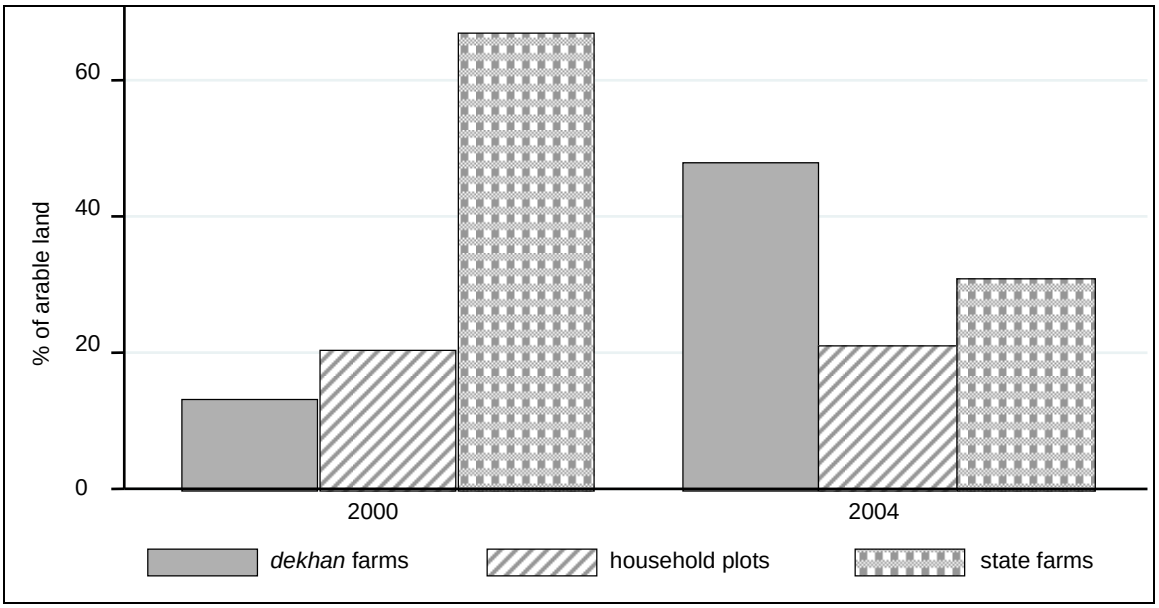
4 State-farms encompass ownership forms of both the *sovhoz* (soviet farms) and *kolhoz* (collective farms), which are effectively the same.

5 A thorough overview of agricultural reforms in Tajikistan is provided in World Bank (2005). The major findings of this study are: (i) the process of land restructuring has been rather inequitable; (ii) the reform of state-farms in especially cotton-producing areas has resulted in numerous distortions; many state cotton farms were dismantled into a number of smaller units, each with a farm manager and 150-200 workers, with workers having little decisionmaking power and being paid mostly in kind; (iii) cotton production under current conditions is generally not profitable to the farmers.

land cultivated under household plots remained stable, at about 20 per cent, but contributing about half of the agricultural output (Figure 2).

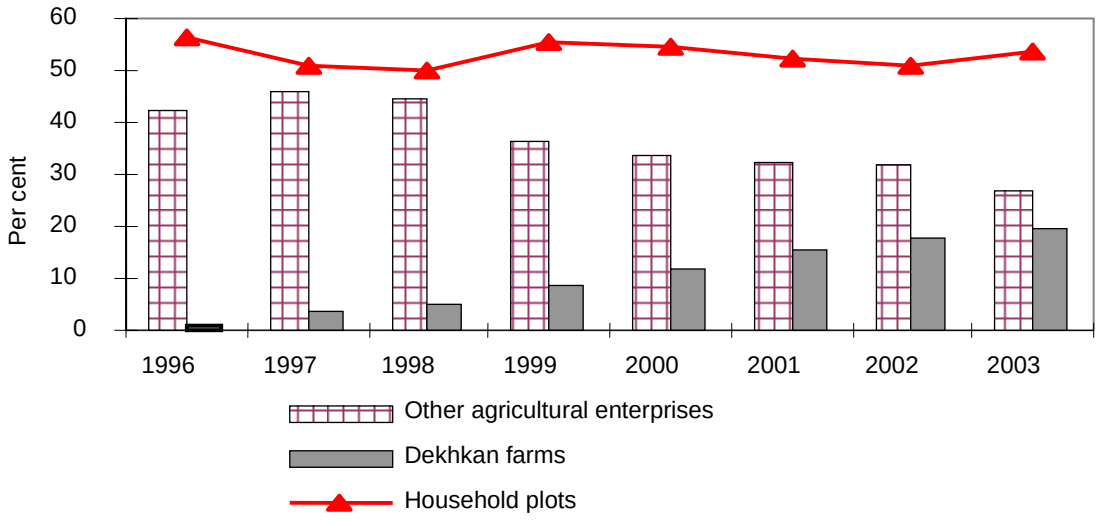
After a period of prolonged decline, Tajikistan's agriculture sector enjoyed noticeable growth after 1999: over the period 1999-2003, gross output increased by 64 per cent, with most of this expansion occurring during 2001-03. The crop sector, which accounts for 81 per cent of output, grew by 65 per cent during 1999-2003, while livestock,

Figure 1
Change in land ownership structure: 2000 to 2004



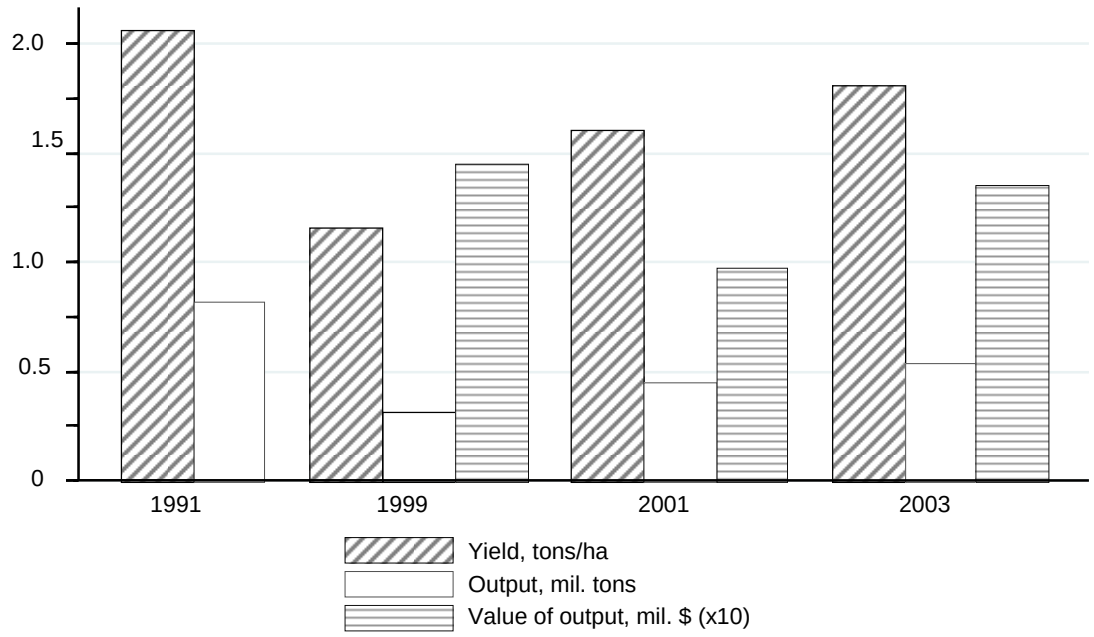
Source: Authors' estimates.

Figure 2
Composition of gross agriculture output



Source: Ukaeva (2005).

Figure 3
Trends in the cotton output, yield and value: 1991 to 2003



Source: Computed by the authors using official data on cotton production.

accounting for 19 per cent of sector output, expanded by 61 per cent.[6] The agricultural production developments of this period can be well illustrated with data on cotton production. Cotton traditionally has been a major agriculture commodity, and continues to account for about two-thirds of total crop output value (Ukaeva 2005). The cotton sector has experienced substantial output fluctuations during periods of civil conflict and economic transition. Between 1991-99, cotton output declined 62 per cent, from 820,000 tons to 313,000 tons, but increased 73 per cent between 1999 and 2003, still accounting for only 65 per cent of the 1991 level. The increase in output is mostly a reflection of improved yields (1.1 tons per hectare in 1999 to 1.8 tons per hectare in 2003, Figure 3) as well as an increase in cultivation area.

The cotton sector in Tajikistan has been severely hit by declining global prices. Despite output increasing by more than two-thirds between 1999 and 2003, the declining global prices reduced the real value of output by 7 per cent during the same period (Figure 3).[7] Adverse developments in international cotton prices, coupled with the farmers' ill-

6 See Ukaeva (2005) for a detailed discussion based on the decomposition of agricultural growth between 1999 and 2003.

7 Due to civil conflict and low cotton production, Tajikistan missed the opportunity to benefit from the historically high cotton prices in the mid-1990s. International cotton prices declined from about UD$0.90 per pound in 1995/96 (the highest level over the last 30 years) to about US$0.45 pound in 2003 (one of the lowest levels over the last 30 years). Since then, prices have bounced back somewhat to about US$0.60 per pound. International prices are projected to remain at about the same level for the next few years, or at least that they are not likely to go up due to such factors as new technologies (genetically-modified cotton), more extensive use of existing technologies, new areas allocated to cotton production (i.e., increased role of China in the global production of cotton), and government policies (such as direct subsides to cotton farmers). For a more elaborate discussion of the issues, see Becerra (2004).

advised pricing arrangements with investors, have resulted in dubious 'debts' that the producers are struggling to repay.[8] These developments are expected to have an impact on the standards of living of Tajikistan's rural population.

2.2 The correlates of rural poverty at the *rayon* level

How are the developments of the rural sector, as outlined above, correlated with poverty? To gain some insights into this issue, we look at the correlation of selected key variables of the rural section at the *rayon* level with the poverty headcount at a similar level, as obtained from the poverty mapping conducted in Tajikistan (Baschieri and Falkingham 2005). Some of the variables will be used later to explain poverty mobility at the household level. A number of interesting findings emerge from simple scatter plots of the district-level data (Figures 4 and 5).

A U-curve relationship exists between the share of land under cultivation in mountainous terrain and poverty headcount, while the share of pastoral land is not correlated with poverty. Overall, about 60 per cent of Tajikistan is covered by mountainous terrain, with significant differences across the *rayons*. The data suggest that both types of territories, whether encompassing an insignificant or a significant percentage of mountainous terrain, are likely to be very poor, with a poverty headcount of about 80 per cent (Panel A, Figure 4). The share of pastoral land does not seem to be a factor (Panel C, Figure 4).

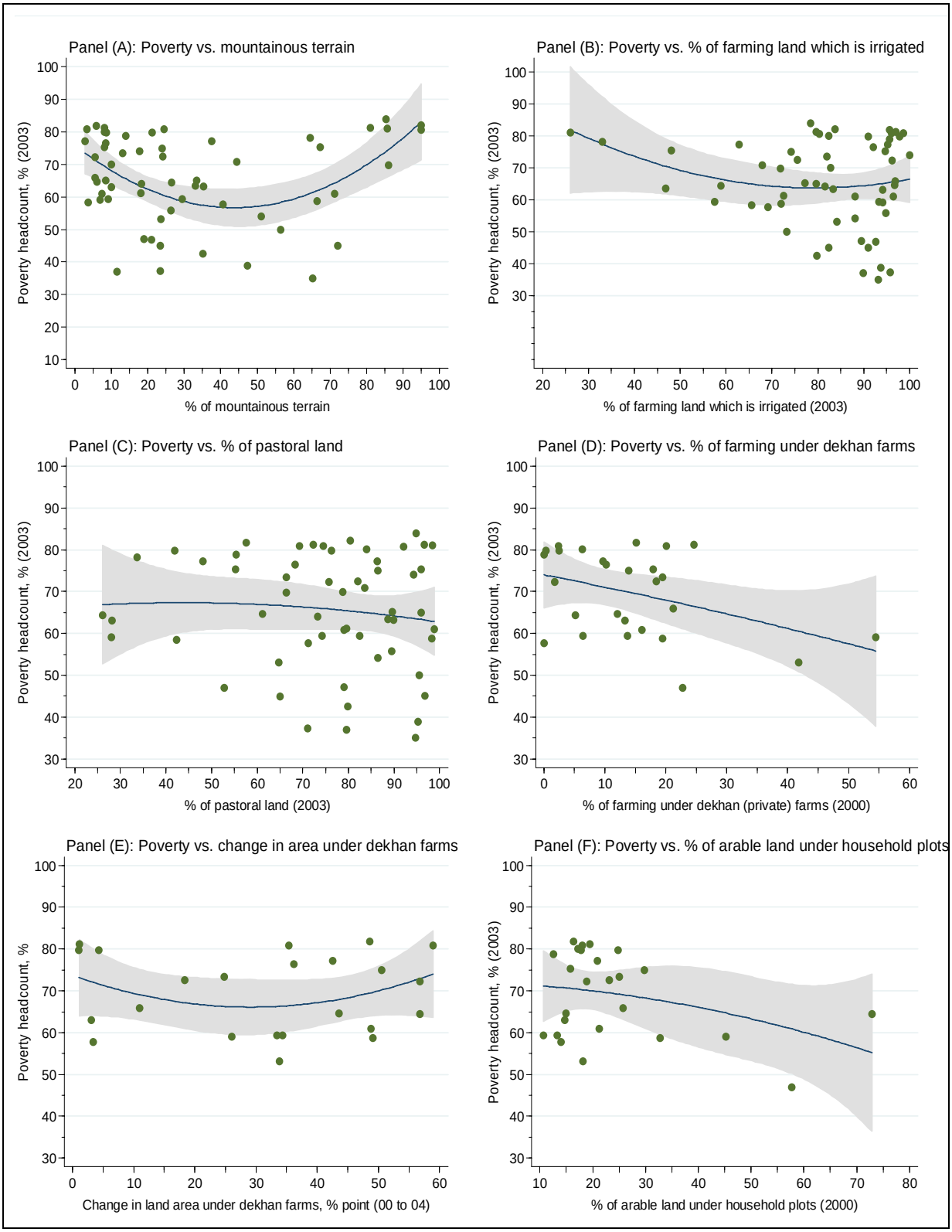
A higher share of irrigated farming land is associated with somewhat lower levels of poverty. However, the level of irrigation is a very weak correlate of poverty. The data indicate that even well-irrigated areas are likely to have huge variations in the level of poverty, ranging from a high of 80 per cent to a low of 40 per cent (Panel B, Figure 4).

A larger portion of land under *dekhan* cultivation is correlated with lower poverty levels. However, the increase in *dekhan* farming land between 2000-04 shows no correlation with poverty. The level of *dekhan* farming in 2000 (prior to its substantial increase in the structure of land ownership) seems to be negatively correlated with poverty headcount (Panel D, Figure 4). However, additional *dekhan* cultivation has not been reflected in poverty levels (Panel E, Figure 4). This finding is consistent with other evidence which suggests that the increasing ratio of *dekhan* cultivation has not been accompanied by improved productivity on these farms (World Bank 2005). Moreover, many of these *dekhan* farms are in cotton production, and have thus been affected by the sector's adverse development.

---

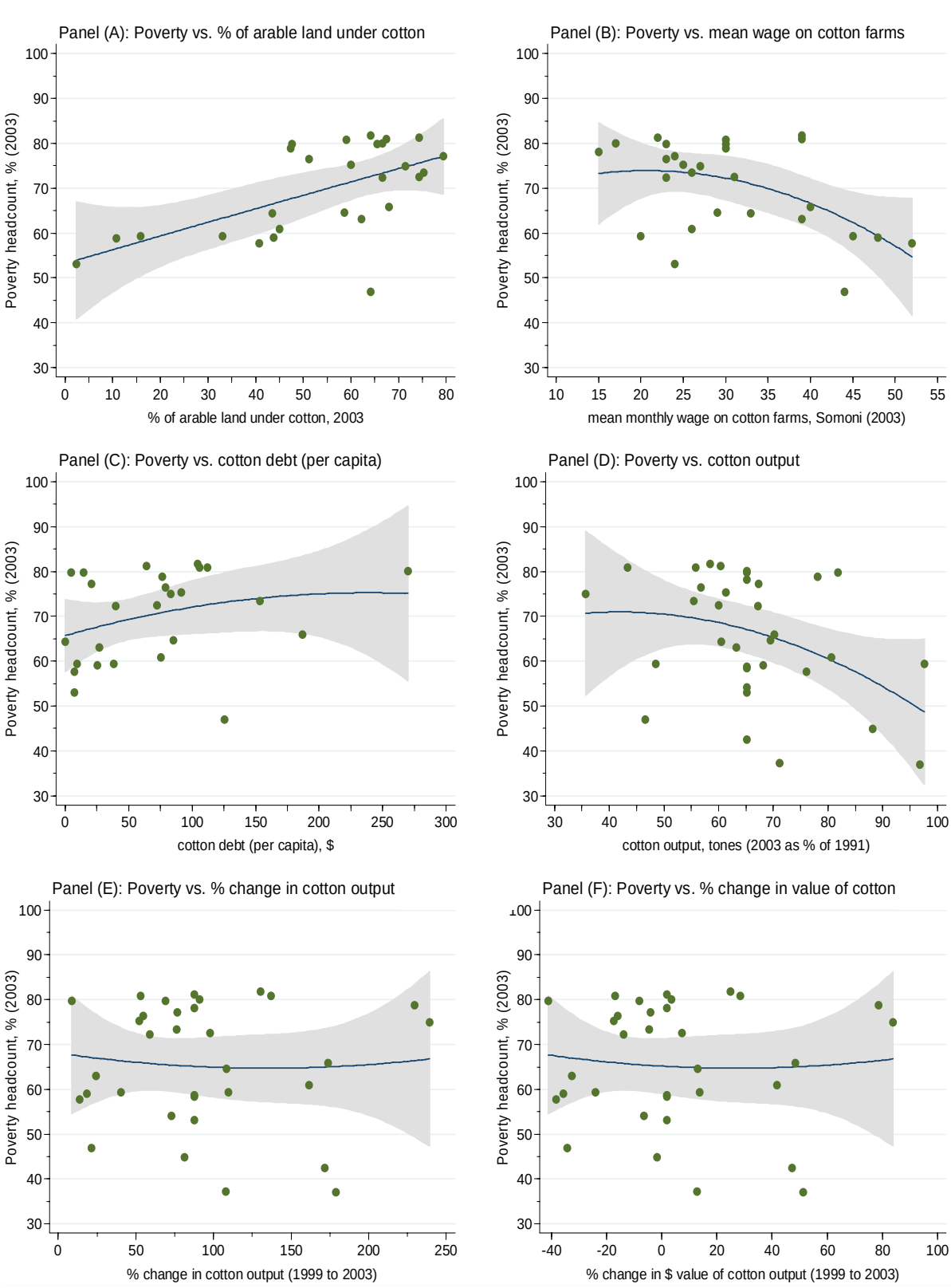
[8] Budgetary pressures in 1997 led the government to sign a partnership with the Swiss cotton trading company, P. Reinhart, which, based on cotton deliveries backed by a government guarantee, was to provide needed financing. In 1998, the government guarantee was replaced with a 'commercial' financing scheme whereby Reinhart worked with a number of local agents (referred to as financiers, futurists or investors). This framework became the basis of cotton production and marketing. Unwise pricing arrangements squeezed the profit margins of the cotton farmers, putting many in a debt trap. These debts, currently estimated at US$280 million, have paralysed the cotton sector, as indebted farmers are unable to obtain credit elsewhere. Indebted farmers are also reluctant to privatize and invest in their land, adding a further impediment to the growth of agriculture sector. For further discussion, see World Bank (2005).

Figure 4
Correlations between rayon (district) poverty headcount* and land variables



Note: * Per cent of the population living on less than US$2.15 per day.
Source: Authors' calculations based on TLLS data.

Figure 5
Correlations between *rayon* (district) poverty headcount* and cotton production



Note: * Per cent of the population living on less than US$2.15 per day.
Source: Authors' calculations based on TLLS data.

A larger share of arable land under household plots is weakly associated with lower poverty levels. The share of this type of land has remained quite stable over time at about 20 per cent. It would appear that districts with a somewhat higher than average share of land under household plots exhibit lower levels of poverty (Panel F, Figure 4). The importance of this type of farming to overall agricultural production is, however, unlikely to change.

The districts with more extensive cotton cultivation are likely to have higher poverty levels (Panel A, Figure 5). As can be expected, there is a negative correlation between a district's average cotton-farm wages and poverty levels (Panel B, Figure 5). Although, this relationship is at least partly driven by the fact that in poorer districts, cotton-farm workers are paid lower wages. We also find that the average wage arrears per person are higher in the poorer areas than elsewhere.[9] These findings suggest that in poorer areas cotton-farm labourers receive smaller wages, and they are less likely to be paid on time. We find a very weak correlation between the level of the cotton-farm debt (per capita) and poverty at the district level.

The extent of decline in output during the 1990s is strongly (positively) associated with poverty. Based on cotton output data, we find that districts with greater output gaps between 1991 (the peak output year before economic collapse) and 2003 are much more likely to be poorer. The deviations in cotton output and its value between 1999-2003 are not correlated with the levels of poverty at the district level.

The above examination of the key correlates of poverty at the district level provides a solid basis for analysing the (asset-based) poverty mobility at the household level in the next section.

3 Theoretical and empirical framework for an asset-based analysis of poverty mobility

3.1 Using an asset-based poverty line to identify poverty transitions

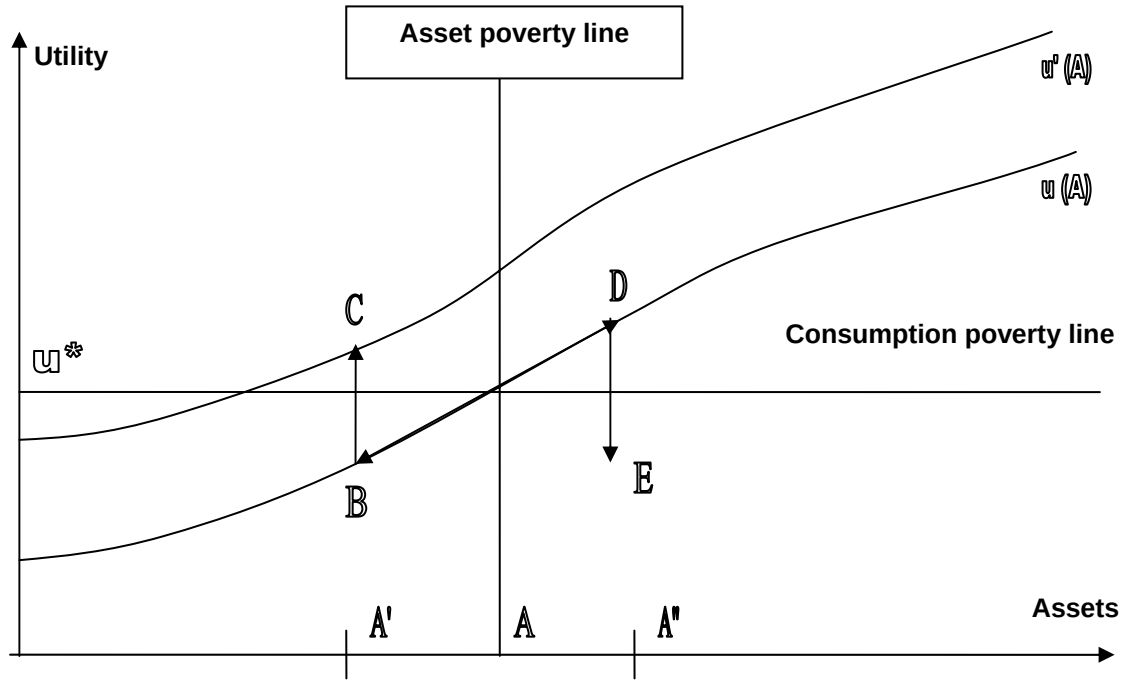
The literature on poverty dynamics has increasingly recognized the importance of adopting an asset-based approach to study changes in wellbeing, especially in response to a wide range of different (climatic, health, political and other) shocks.[10] Differentiating between stochastic and structural poverty transitions implies the availability of information on assets and expected levels of wellbeing. To illustrate the importance of the assets-based approach in capturing welfare-status changes, we use the conceptual framework advocated by Carter and May (2001) and Carter and Barrett (2006). This framework is presented in Figure 6.

In essence, in any timeperiod a household can be regarded as *structurally poor* if household consumption falls below the consumption poverty line **u*** and its stock of

9 The graph is not presented here, but available from the authors on request.

10 See February 2006 special issue of the *Journal of Development Studies,* 42 (2) for the set of papers presenting the conceptual framework and empirical evidence for an asset-based approach.

Figure 6
Poverty transitions: consumption poverty line vs. asset poverty line



Source: Carter and Barrett (2006).

assets falls below the asset poverty line **A**.[11] Such a state is described by point **B** in Figure 6. A household can be regarded as *stochastically poor* if it holds assets above level **A**, yet its level of consumption is below the poverty line **u*** (described by point **E** above). A household that has over time moved from below to above the consumption poverty line **u*** could be regarded as having made a *stochastic transition out* of poverty if its assets are still mapped below the asset poverty line **A.** This case is represented in by the shift from point **B** to point **C,** which may occur because of increased crops in a given year due to favourable weather conditions. As a result, the livelihood function shifted upwards from **u (A)** to **u' (A)**, reflecting the increased returns on existing assets.

The *stochastic transition into* poverty is represented here by the shift from point **D** to point **E,** whereby household consumption drops below the poverty line, as returns to existing assets temporarily diminish, but the level of asset holdings stays above the asset poverty line. This is exemplified by the household that has experienced a temporary consumption decline because of a negative shock (e.g., drought), but is expected to bounce back to a level of consumption above the poverty line. A household that has shifted over time across the consumption poverty line **u*** could be regarded as having made a *structural transition out* of poverty, if it has also accumulated sufficient additional assets to move above the asset poverty line **A** (represented here by the shift from point **B** to point **D**). Conversely, the shift from point **D** to point **B** would represent the *structural transition into* poverty. As Figure 6 indicates, there could be multiple options for poverty transition paths, but the main point here is that changes in

11 The asset poverty line in Figure 1 is simply the level of assets corresponding to the level of wellbeing equal to the consumption poverty line.

consumption that are not accompanied by changes in the assets base can be regarded as stochastic rather than structural transitions.

3.2 Data

This paper uses panel components from two surveys: the 2003 Tajikistan Living Standard Survey (TLLS) and the 2004 Energy Household Survey (EHS). The 2003 TLLS provides a nationally representative sample of households stratified by *oblast* and rural/urban settlements based on a selection of households recorded in the 2000 census. The survey was conducted during June-July 2003. The sample size is 4,156 households representing 26,141 individuals. The 2004 EHS survey was conducted between July and November of 2004. The sample, also representative of the overall population, includes 2,600 households and 15,339 individuals. The panel component consists of 1,396 households representing 8,368 individuals; 589 of the households are rural.[12] The 2004 HES used the same sample frame (list of clusters) as the 2003 TLLS. A comparison of the distribution of the basic variables from the panel sample against the 2003 cross-section indicates that the panel sample is fairly representative of the overall population, both at rural and urban levels.

Both surveys collected information on such household attributes as demographics, education and health, income and expenditures, assets, and consumption. The analysis of poverty dynamics here uses the panel component of the two surveys, and is based on an asset index. Construction of the asset index is described below.

In addition to utilizing household-level data, the empirical analysis at the micro (household) level exploits a few key district-level variables to capture agricultural reform and various policy changes (discussed earlier). The analysis also uses community survey data from the 2003 TLLS, to allow us to identify whether cotton was grown in a particular community, whether rainfall during the survey year was better/worse relative to the previous year, as well as certain other important community-level characteristics that are likely to be associated with a household's mobility out of or into poverty.

3.3 Constructing the asset index and asset-based poverty line

In order to construct an asset index, we rely on principal component analysis (Lawley and Maxwell 1971).[13] The principal component constitutes a linear index capturing most of the information (variance) common to all the variables. Denoted by A_{ij} the observation for household i and asset j (for example, whether or not a household has a

---

12 The majority of households in the panel are urban because the 2004 EHS over-sampled these areas.

13 For a comprehensive discussion of the pros and cons of an assets-based welfare analysis, see Filmer and Pritchett (1998), Sahn and Stifel (2000), and Sahn and Stifel (2003). An asset index retains certain properties necessary for proper welfare analysis, such as transparency in construction and ranking individuals credibly in terms of welfare. As argued by Filmer and Pritchett (1998), Carter and May (2001) and Carter and Barrett (2006), an asset index is likely to be a better indicator of the long-run household wealth than per capita household consumption. However, a significant limitation of an assets index is that it treats ownership of assets as giving similar utility without allowing for differences in unobserved quality.

television). Principal component analysis finds a small number of n factors, denoted by the letter f, which can be used to reconstruct the original variables (in this case the original information on assets) as linear functions of the q factors, so that :

$$A_{ij} = f_{i1}\,\beta_{1j} + f_{i2}\,\beta_{2j} + ... + f_{iq}\,\beta_{qj} + \varepsilon_{ij} \qquad (1)$$

In (1), A_{ij} is known since it is one of the values describing whether or not household i has asset j. The term f_{ik} represents the observation for household i of the value of factor k which needs to be estimated. The term β_{kj} is the coefficient indicating the dependence of the observed asset variable j upon the factor k, this coefficient being also estimated. The residual, $\varepsilon_{ij,}$ is the error term. In other words, factor analysis produces an index representing (through the vector of common factors **F**) the data generating process underlying the actual observations A_{ij}. This is done by finding the one dimension of the space in which the original observations are represented with the largest variance, from $j = 1, ..., p$ to $k = 1, ..., n$ with $n<p$.

Only assets found to be fully comparable in both surveys were used for the analysis. These included the number of such items as: kerosene stoves, wood-burning stoves, refrigerators, generators, freezers, washing machines, microwaves, black and white TVs, colour TVs, video players, CD/tape recorders, video cameras, electric radiators, air conditioning units, water boilers, computers, satellite dishes, motorcycles or scooters, cars, trucks, and tractors.

Table 1
Change in average number of main assets possessed by households and score coefficients
(Tajikistan 2003 to 2004, panel sample)

	All households			Rural households			Urban households			
No. of:	2003 Mean	2004 Mean	Growth rate, %	2003 Mean	2004 Mean	Growth rate, %	2003 Mean	2004 Mean	Growth rate, %	Asset score coefficient
Colour tv sets	0.355	0.449	26.3	0.182	0.291	60.1	0.457	0.541	18.4	0.311
	0.000	*0.000*		*0.000*	*0.000*		*0.000*	*0.000*		
Video players	0.137	0.233	70.0	0.087	0.173	100.3	0.167	0.268	60.7	0.297
	0.000	*0.000*		*0.000*	*0.000*		*0.000*	*0.000*		
Refrigerators	0.433	0.473	9.3	0.236	0.264	11.7	0.548	0.596	8.7	0.207
	0.000	*0.000*		*0.000*	*0.000*		*0.000*	*0.000*		
Washing machines	0.159	170.0	6.8	0.117	0.099	-15.8	0.183	0.211	15.1	0.199
	0.000	*0.000*		*0.000*	*0.000*		*0.000*	*0.000*		
Electric radiators	0.179	0.017	-90.6	0.061	0.000	-100.0	0.248	0.027	-89.2	0.158
	0.000	*0.000*		*0.000*	*0.000*		*0.000*	*0.000*		
Cars	0.135	0.153	13.6	0.146	0.163	11.8	0.128	0.147	14.7	0.269
	0.000	*0.000*		*0.000*	*0.000*		*0.000*	*0.000*		
Wood stoves	0.648	0.458	-29.3	1.076	0.827	-23.2	0.398	0.244	-38.8	0.011
	0.000	*0.000*		*0.000*	*0.000*		*0.000*	*0.000*		
Black-white TVs	0.521	0.498	-4.4	0.577	0.585	1.3	0.489	0.448	-8.3	-0.090
	0.000	*0.000*		*0.000*	*0.000*		*0.000*	*0.000*		

Note: Standard errors in italics. Some high growth rates are the result of the very low base. Score coefficient indicates the weight of the particular asset in the calculation of the total asset score.

Source: Authors' estimates based on the 2003 LSMS and 2004 EHS.

Asset indexes typically also include housing characteristics, such as the type of floor and walls of the dwelling. However, given that the analysis is based on a one-year panel, housing variables remained largely unchanged and were thus excluded. We also excluded variables related to the ownership of agricultural assets and livestock. If the accumulation of assets in the rural areas takes place largely through the acquisition of agricultural assets, the omission of these variables from the asset index is likely to underestimate welfare changes. However, as discussed in greater detail later, according to the data, significant changes in rural households concern the possession of durable goods (which make up the asset index).[14] In fact, rural households accumulated major durable goods faster than urban households (Table 1).

Moreover, as our attempt is to understand the determinants of rural households in moving in/out of assets-based poverty, the exclusion of agricultural assets and livestock in the asset index may even be advisable. This is because household agricultural assets and community agricultural characteristics (explanatory variables in our regression model) are likely to be determined simultaneously by such factors as agricultural reform, thus representing an endogeneity problem.

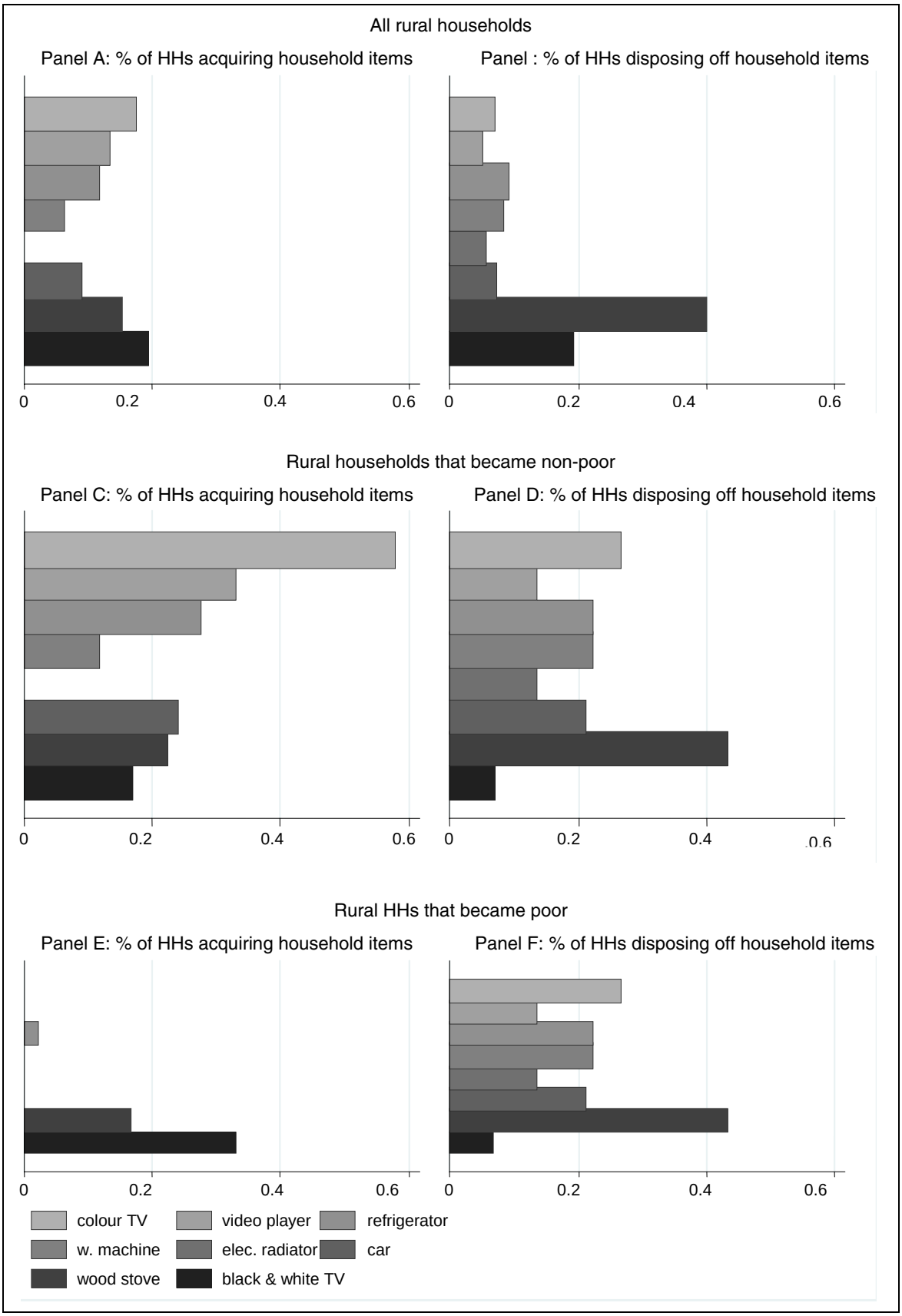
Analysing changes in the possession of the durables making up our asset index, we find that the average (per household) number of colour TVs, video players, refrigerators, cars and other goods increased noticeably between 2003-04, particularly in the rural regions. The average number of wood-burning stoves and black and white TVs declined during the same period. There was also a noticeable decline in the number of electric radiators, presumably because of rising electricity costs. The last column in Table 1 presents the asset scoring coefficient (from the factor analysis) for the major assets owned by households. The scoring coefficient effectively indicates the weight of a specific variable in estimating the total asset score. A positive coefficient suggests a positive association between having the particular asset and the overall welfare index. A higher value of the scoring coefficient suggests a stronger association. Note that most of the assets for which possession increased between 2003-04 display a positive scoring coefficient with magnitudes between 0.2 and 0.3. Finally, ownership of assets such as the wood stoves, usually associated with lower welfare, decreased between 2003-04. The scoring coefficient for wood stoves is close to zero, suggesting a rather flat association between having the asset and household welfare. The scoring coefficient for black and white TVs is even negative. It is important to note that the scoring coefficients are estimated with the pooled 2003 and 2004 samples (panel), which make the estimated asset indices fully comparable between the two years.

It is worth noting that there was a substantial mobility in the ownership of various assets, with households acquiring and disposing of assets. For instance, about 20 per cent of rural households overall acquired a colour TV (Panel A, Figure 7), while this figure was almost 60 per cent among the households who had moved out of poverty (Panel C, Figure 7). About 15 per cent of rural households bought a video player (Panel A, Figure 7), while at the same time about 5 per cent of these households got rid of one (Panel B, Figure 7).

---

14 Another important consideration is that an assets index that includes only durables may be better at capturing transitions out of structural poverty, but not transitions into structural poverty (unless rural household, when faced with hardships, prefer to sell durable goods before selling agricultural assets or livestock). However, application of the asset index to the panel data indicates that in the rural regions the share of households escaping poverty (35.1 per cent) is almost equivalent to those who fall into poverty (34.1 per cent).

Figure 7
Share of rural households who acquired or discarded assets (panel households)



Source: Authors' estimates, based on 2003 LSMS and 2004 EHS.

About 28 per cent of the households that had exited poverty bought a new refrigerator (Panel C, Figure 7), while about 22 per cent had disposed of one (Panel D, Figure 7).[15] Households that had become (asset) poor displayed a substantial shedding of assets (Panel F, Figure 7). Only wood stoves and black and white TVs were among the goods acquired by this household group (Panel E, Figure 7). As mentioned above, scoring coefficient for a wood stove is close to zero, while it is negative for a black and white TV. The presented data clearly suggest that the ownership of assets by rural households in Tajikistan has been far from a static process, even in a period as short as one year.

We set up an asset-based poverty line at a level equivalent to the 50th percentile of the asset index distribution (using 2003 distribution). The chosen cut-off level is rather arbitrary, but is consistent with the fact that over half of the population—based on a welfare indicator of per capita consumption and the poverty line of US$2.25 per day—is estimated to be poor. The 50th percentile cut-off level was also used in a previous study of poverty dynamics in urban and rural Tajikistan (Angel-Urdinola, Mete and Cnobloch 2008).[16]

Given this asset-based poverty line, what was the extent of the poverty mobility among rural households in the panel? The poverty mobility matrix is presented in Table 2. Out of 322 households qualifying as asset-poor in 2003 (base year) 113 households, or 35 per cent, had moved out of poverty a year later. Out of 267 households classified as non-poor in the base year, 91 households, or 34 per cent, had become poor one year later. In terms of the share of the total panel sample, 19 per cent of households had shed poverty and 15 per cent had become impoverished. These findings confirm substantial mobility in asset holdings even over a relatively short period of time. The regression analysis in the following section attempts to explain this mobility with an array of variables at the household, community and district level.

Table 2
Poverty mobility (based on assets) for rural households

	Retained status, 2004			Changed status, 2004			Total		
Poverty status, 2003	N	% of total	% of row total	N	% of total	% of row total	N	% of total	% of row total
Poor	209	35.5	64.9	113	19.2	35.1	322	54.7	100.0
Non-poor	176	29.9	65.9	91	15.4	34.1	267	45.3	100.0
Total	385	65.4	65.4	204	34.6	34.6	589	100.0	100.0

Source: Authors' estimates, based on 2003 LSMS and 2004 EHS.

15 It is worth noting that in many cases while a new asset is purchased, the old one will be just discarded unless it has tradable value on the market. When a household replaces an old TV, its asset position does not change, but if merely gets rid of the old set without buying a new one, its wealth position deteriorates.

16 In the study by Angel-Urdinola, Mete and Cnobloch (2008), the authors have an urban/rural dummy in their panel sample that includes households living in both urban and rural areas. They do not attempt to investigate the determinants of welfare dynamics that would be specific to rural areas.

3.4 The empirical model

The event of a household transiting out of (or into) (asset-based) poverty is modelled within the probability framework. The (ex-post) realization of the event (experience of the transit into (out of) poverty between 2003-04) is used to define the samples at risk of leaving (falling into) poverty. The probability of experiencing a transit out of (or into) poverty is modelled as follows:

$$\Pr(P^0_{i,t} = 0 \mid P^0_{i,t-1} = 1;\ D_{i,\,t\text{-}1,}\, X_{i,t\text{-}1},\, X_{R,,t\text{-}1},\, \boldsymbol{\beta}) = \Phi(D_{i,\,t\text{-}1,}\, X_{i,t\text{-}1},\, X_{R,,t\text{-}1},\, \boldsymbol{\beta}) \quad (1)$$

$$\Pr(P^0_{i,t} = 1 \mid P^0_{i,t-1} = 0;\ D_{i,\,t\text{-}1,}\, X_{i,t\text{-}1},\, X_{R,,t\text{-}1,}\, \boldsymbol{\beta}) = \Phi(D_{i,\,t\text{-}1,}\, X_{i,t\text{-}1},\, X_{R,,t\text{-}1,}\, \boldsymbol{\beta}) \quad (2)$$

Equation (1) models the probability of a household to be non-poor in period *t* (2004) conditional on being poor in period *t*-1 (2003). Equation (2) models the probability of a household to be poor in period *t* (2004) conditional on being non-poor in period *t*-1 (2003). As is already clear from the discussion, P^0 is the indicator of being poor based on the asset poverty line. Both equations are modelled conditional on a household's distance from the poverty line in period *t*-1, which is denoted by $D_{i,\,t\text{-}1.}$[17] $X_{i,t\text{-}1}$ denotes various household-level characteristics, and $X_{R,t\text{-}1}$ denotes various regional-level characteristic at the region (*oblast*), district (*rayon*) and community (village) level. **β** denotes the vector of parameters. It is important to note that although for ease of presentation $X_{R,t\text{-}1}$ indicates that the variable is expressed in levels at time *t*-1, some variables in the model actually capture changes occurring before *t*-1. For instance, a community reports rainfall shocks between *t*-2 and *t*-1. We also investigate the impact on the poverty mobility of the share of cultivation under private farming at time *t*-4, as well as the impact of the change in this variable between *t*-4 and *t*-1. In other words, some of the explanatory variables are lagged by more than one year; and that some explanatory variables are actually changes rather than levels. These equations are estimated using the maximum-likelihood estimator.

4 Empirical results

Appendix Tables 1-3 present the estimation results for three alternative models exploring the predictors of moving out of and into poverty. Model 1 looks at poverty mobility predictors where community-level characteristics are *not* included among the regressors (Appendix Table 1). It includes household head characteristics such as age, gender, education, and self-reported health status; household demographics such as the share of adults; employment status of household members; and regional (*oblast*) dummies. Model 1 is estimated using two specifications, with and without district (*rayon*) characteristics. For ease of comparison of the coefficients, the estimation results of the moving-out of poverty model are presented next to the estimation results of the becoming-poor model.

---

17 The poverty mobility literature often uses a specification in which the event is conditional on the distance from the poverty line (e.g., Canto 2002). This improves the overall fit of the model and allows one to obtain more accurate parameter estimates on other variables of interest.

Model 2 extends on Model 1 by including community-level characteristics among the explanatory variables (Appendix Table 2). These include the size of the population point, distance to the nearest market, whether cotton is produced in the area, and the reported amount of rain compared to the previous rain. Model 2 is also estimated based on two specifications: excluding the interaction between the 'cotton' variable (dummy variable indicating if cotton produced in the community) and various other factors (specification 1). Specification 2 includes the interactions between the 'cotton' variable and such factors as distance to market, share of household adults working in agriculture, education status and gender of the household head. These interaction terms are designed to gain a better understanding of the importance of the 'cotton' variable in explaining the poverty transitions.

Model 3 uses a richer set of district-level characteristics that apply only to cotton-producing districts in order to get a better understanding of poverty mobility in these areas (Appendix Table 3). It is worth noting that two-thirds of the households in the rural panel sample reside in the cotton-producing districts. Here, we investigate a few, very important agricultural policy variables that impact on poverty mobility: the share of total arable land under cotton, cotton farm debt (per hectare of cotton-cultivated land), share of arable land under *dekhan* (private farms) in 2000 (prior to its significant increase), and the change in the share of *dekhan* land between 2000-04. Again, Model 3 is estimated with two specifications: specification 1 includes the interaction terms for the 'cotton' variable, while specification 2 ignores the interaction terms.

While the main purpose of this exercise is to explore the effects of various additional variables, it also enables us to investigate the robustness of the regression results. Next, we discuss the effects of the variables that had statistically significant coefficient estimates across different specifications.[18]

4.1 The main predictors of moving out of poverty

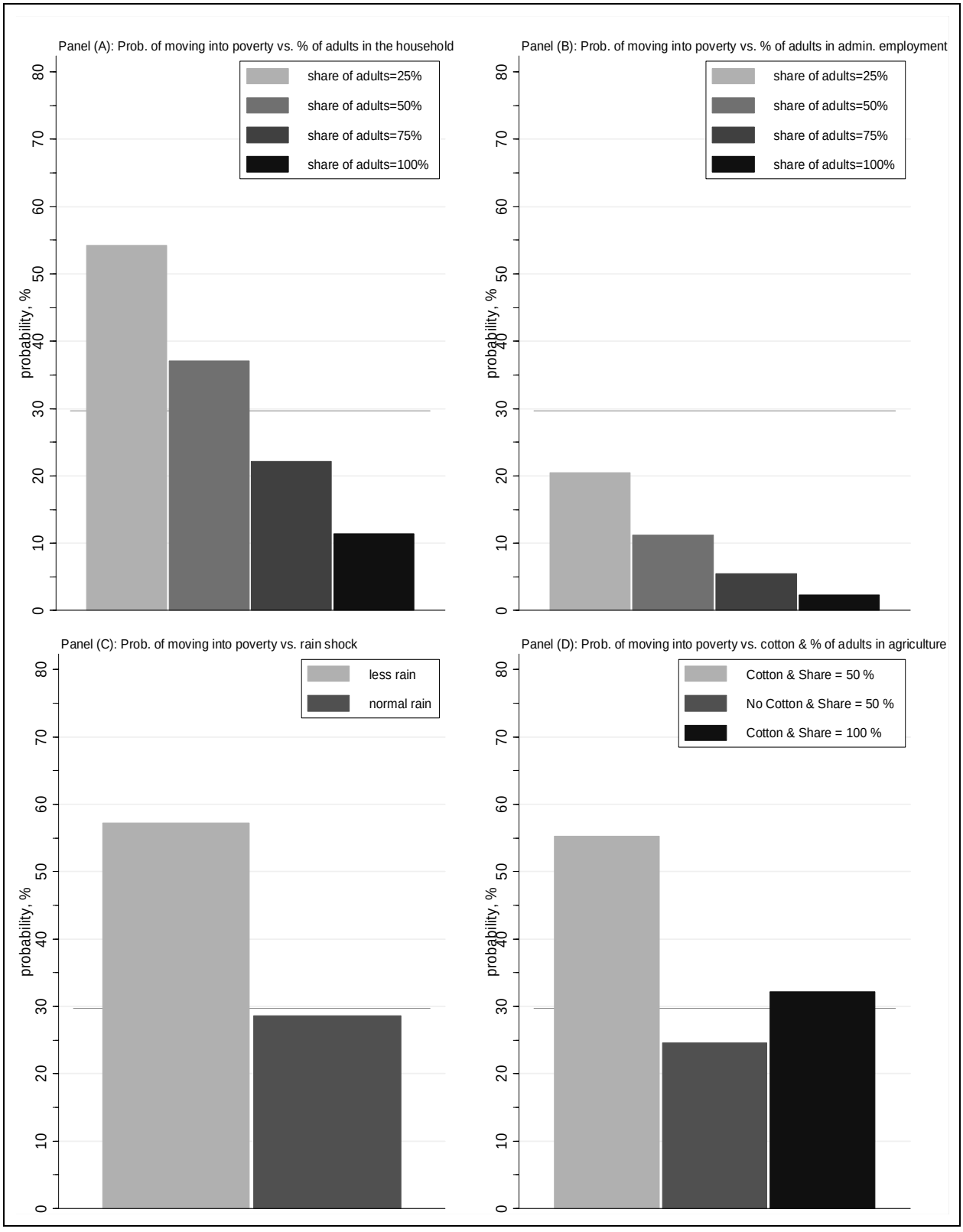
The sample of all rural households

The probability of climbing out of poverty is significantly affected by both geographical factors and household-level characteristics. The level of poverty in a district is a significant predictor of poverty mobility at the household level. The estimates indicate that, after controlling for other characteristics, for a household located in a district with 30 per cent poverty headcount (based on the US$2.15 per day poverty line), there is a 70 per cent probability of escaping poverty, while the probability is a mere 5 per cent for a household located in a district with a poverty headcount of 90 per cent (Panel A, Figure 8).[19] Thus living in a region with weak economic growth performance

[18] For calculating the predicted probabilities of moving out of/into poverty for the overall rural sample, we use the regression results given in Appendix Table 2 (with interaction terms); for the sample of rural households living in cotton-producing areas, we use the regression results given in Appendix Table 1 (with interaction terms). However, as already mentioned earlier, in calculating these predictions we focus only on the variables which produced robust effects across the different specifications.

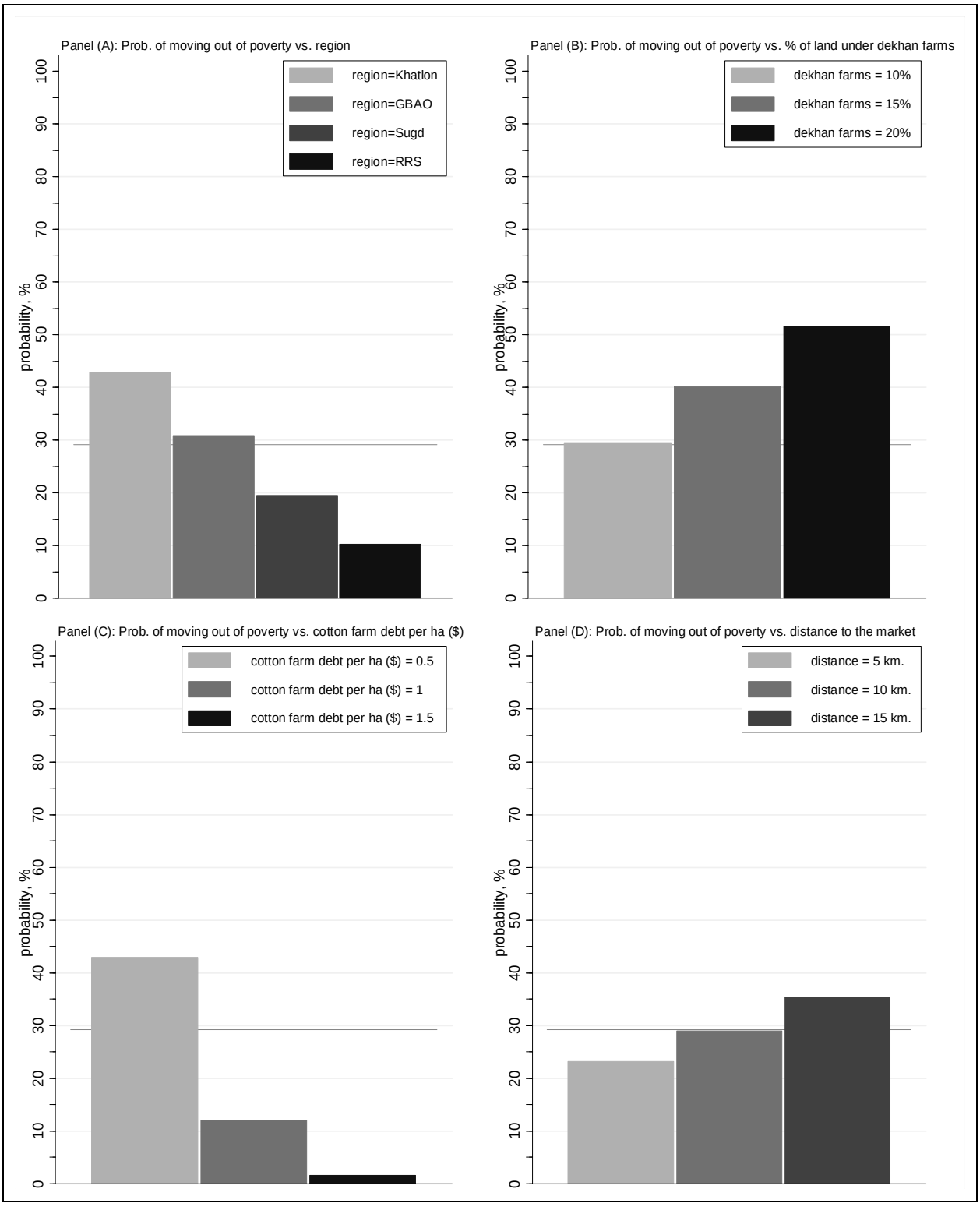
[19] The horizontal line in the graphs indicates the predicted probability of climbing out of, or falling into, poverty at the means of variables in the estimation sample. In other words, this line indicates the average odds of poverty transition.

Figure 8
Determinants of the probability of MOVING OUT of poverty



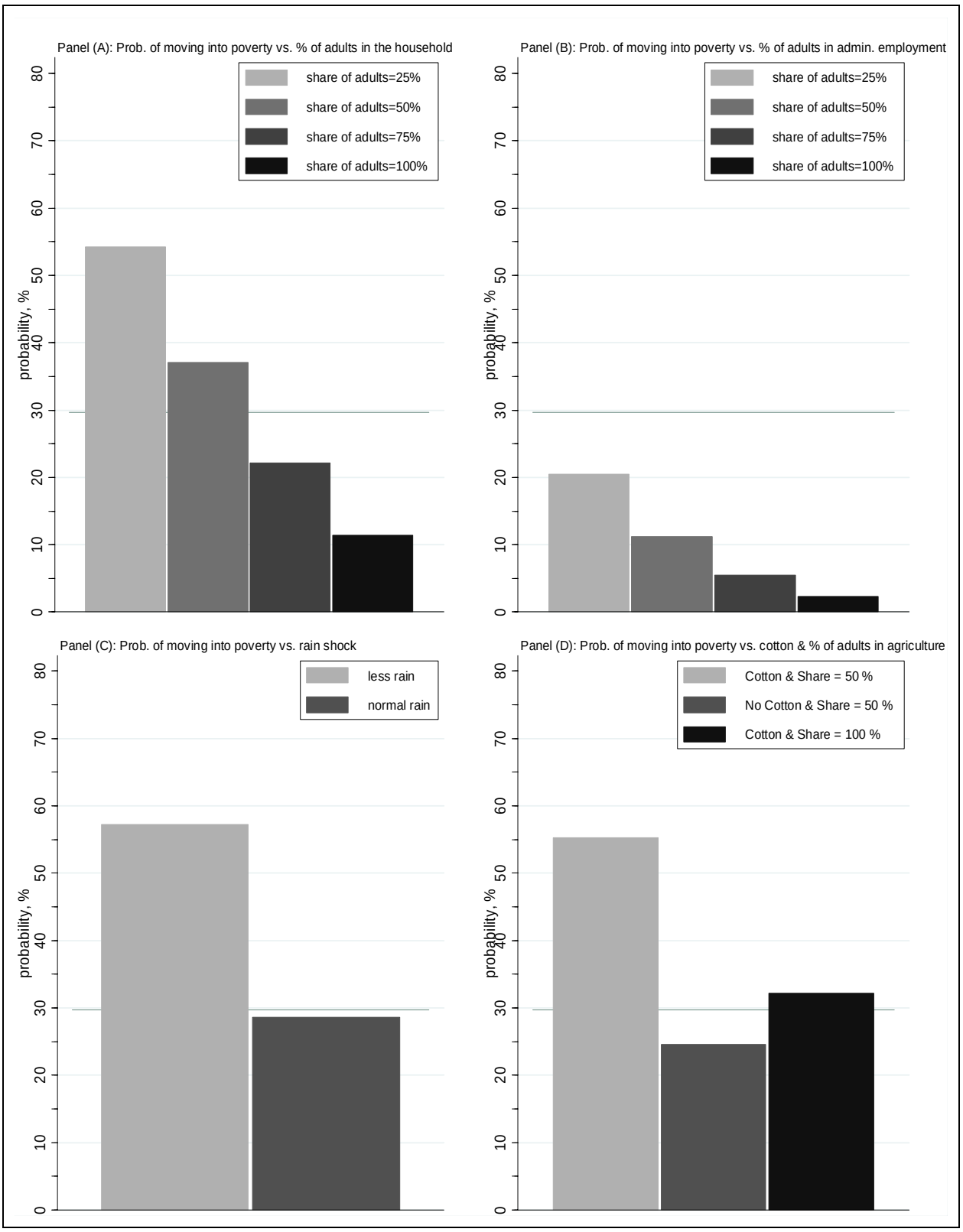
Source: Authors' estimates, based on 2003 LSMS and 2004 EHS.

Figure 9
Determinants of the probability of MOVING OUT of poverty
(cotton-producing districts only)



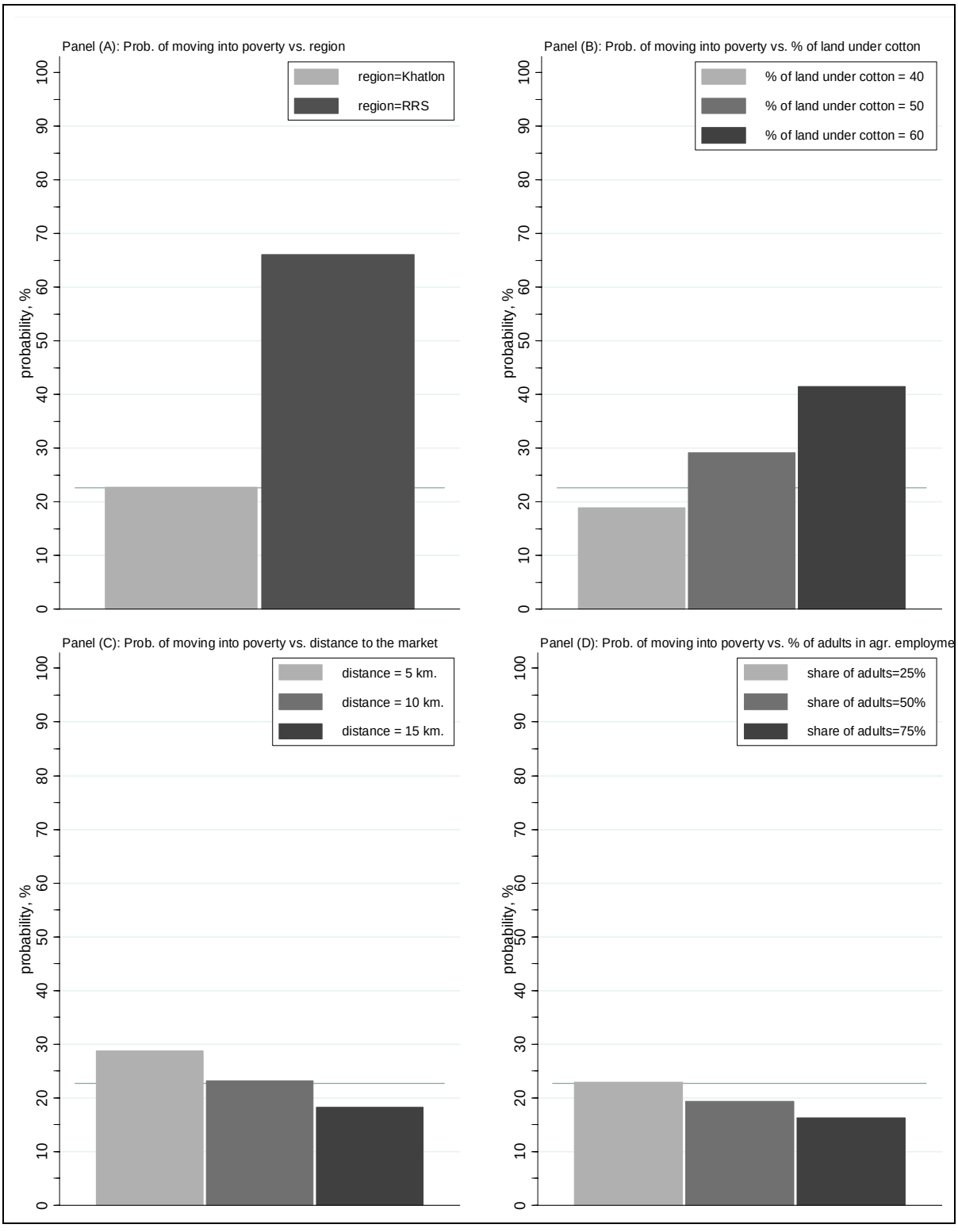
Source: Authors' estimates, based on 2003 LSMS and 2004 EHS.

Figure 10
Determinants of the probability of MOVING INTO poverty



Source: Authors' estimates, based on 2003 LSMS and 2004 EHS.

Figure 11
The determinants of the probability of MOVING INTO poverty
(cotton-producing districts only)



Source: Authors' estimates, based on 2003 LSMS and 2004 EHS.

significantly reduces the chances of moving out of poverty. Even when the district poverty headcount is controlled for, living in the RRS region is associated with more than 30 per cent lower chance of shedding poverty than in Khatlon (the reference region in the regression) (Appendix Table 2). This reflects the fact that between 1999 and 2003, RRS had the lowest rate of per capita GDP growth, averaging annually only 2 per cent while it was 14 per cent in Khatlon (GBAO and Sugd had comparable rates of growth). Location in neither a cotton-producing district or a cotton-producing community has no bearing on the odds of moving out of poverty. Controlling for other factors, cotton production in a district is found to have no statistically significant impact on household mobility out of poverty (Appendix Table 1). The same is true with respect to the impact of living in a cotton-producing community (Appendix Table 2).

At the household level, household head's schooling is related to a significantly higher probability of escaping poverty. The estimates suggest that the probability of shedding poverty increases from the 25 per cent that applies to the household head with less than secondary education to 50 per cent for those with university education (Panel B, Figure 8). Better health status also improves the odds of moving out of poverty: the probability of exiting poverty rises from about the 17 per cent observed for household heads with (self-reported) bad/very bad health to almost 40 per cent for those enjoying good/very good health (Panel C, Figure 8). Finally, a larger share of adults in wage employment has a positive impact on the poverty exit probability. This improves from 30 per cent to 50 per cent as the share of adults in hired employment goes up from 25 to 100 per cent (Panel D, Figure 8).

The sample of rural households located in cotton-producing communities

Using the sample of households located in cotton-producing districts only, we can explore the impact on poverty mobility of several variables related to the structural (and exogenous) changes that have taken place in the agricultural sector of Tajikistan. Regional factor has a substantial impact on poverty mobility in cotton-producing districts (similar to its impact for all rural households). In the cotton-producing districts of the country, the probability of moving out of poverty ranges from 10 per cent in RRS to 43 per cent Khatlon (Panel A, Figure 9). Larger initial fraction of land under private farming (*dekhan*) improves the odds: the chances of exiting poverty increase from 30 per cent when a tenth of the land is *dekhans* (the average level in 2000) to 70 per cent when the share of these farms increases to 30 per cent (Panel B, Figure 9). However, the rate of increase in the share of *dekhan* farming between 2000 and 2004 shows no association with the chances of shedding poverty. The estimated effect of this variable is not statistically significant (Appendix Table 3). The extent of the cotton farm debt (per hectare of land under cotton cultivation) has a strong impact on poverty mobility. It is estimated that if the debt were to double from US$0.5 to 1.00 per hectare, the probability of moving out of poverty would drop from 40 per cent to 10 (Panel C, Figure 9). Also, distance to market in cotton-producing areas affects poverty mobility. A somewhat counterintuitive finding is the observation that greater distances to market or the district centre improve the odds of moving out of poverty (Panel D, Figure 9). However, one needs to bear in mind that several earlier studies on Tajikistan (World Bank 2006) indicate a high degree of government control and regulation of the cotton market. It may well be that our finding indicates that being in the proximity of the 'watchful eye of the state' does not promote the sharing of benefits from cotton production. It would be useful to explore this finding further in future research.

4.3 The main predictors of moving into poverty

The sample of all rural households

The factors that explain a household's likelihood to fall into poverty are different from those that explain moving out of poverty (Appendix Tables 1 and 2). The probability of moving into poverty declines significantly once the share of working-age individuals in a household increases. The estimates suggest that the probability of falling into poverty declines from 55 to 10 per cent when the share of adults increases from 25 to 100 per cent (Panel A, Figure 10). Employment in public administration reduces the risk of impoverishment: the probability of falling into poverty drops from 20 to 3 per cent as the share of adults in administrative employment increases from 25 to 100 per cent (Panel B, Figure 10). Household size is also a factor: the estimates suggest a U-shaped relationship between the probability of becoming poor and household size (Appendix Table 2). In other words, small households (elderly people living alone) and very large households (usually households with many children) face a higher risk of falling into poverty than the average-sized household.

Examining the impact of district/community level characteristics, we find that variations in rain fall are associated with the risk of becoming poor. Households located in communities with less than average amount of rain over the previous year face a 55 per cent chance of becoming poor versus 28 per cent for households in non-drought communities (Panel C, Figure 10). Agricultural employment in cotton producing areas is associated with a *higher* risk of impoverishment compared to similar employment in non-cotton producing areas.[20] According to estimates, if half of the adults in a cotton-producing district work in the agricultural sector, the risk of poverty in the cotton-producing areas is 55 per cent, but only 25 per cent in non-cotton areas. However, increasing the share of household members employed in agriculture in cotton-producing areas improves the odds of *not* falling into poverty (Panel D, Figure 10).

The sample of rural households located in cotton-producing communities

Using the sample of only those households that are located in cotton-producing districts, we note the following major findings. Region of residence has a substantial impact on poverty mobility in cotton-producing districts (similar to its impact on the probability of moving out of poverty). Households in the RRS region face a 65 per cent probability of falling into poverty, while this is 20 per cent for those living in Khatlon (Panel A, Figure 11). A higher share of land under cotton cultivation in the district *increases* the risk of falling into poverty: once the share of cotton-cultivated land increases from 40 to 60 per cent, this compounds the odds from 20 to 40 per cent (Panel B, Figure 11). Distance to market is also a factor: the estimates suggest that as distance increases, the probability of becoming poor generally declines (Panel C, Figure 11). The explanation here is likely to be the same as discussed above in the case of moving out of poverty. A larger proportion of adults in agricultural employment reduces the probability of falling into poverty. But the effect is very marginal. As the share of agricultural employers increases from 25 to 75 per cent, the odds of becoming poor decline from 22 to 16 per cent (Panel D, Figure 11).

---

20 The household survey data do not specify how many adults are actually employed in the cotton farm (no cotton is produced on household plots). However, it is safe to assume that agricultural employment in cotton-producing areas consists mostly of employment in the cotton sector.

5 Conclusions

Tajikistan's rural sector has witnessed substantial changes since the country emerged from civil conflict in 1999. Gross agricultural output increased 64 per cent from 1999 to 2003, and there were also significant developments in the agricultural reform agenda, including a rapidly changing structure of land ownership as the old soviet-era farms were dismantled and private-owned *dekhan* farms created. During this period there was a noticeable increase in crop yields, including cotton, the major agricultural commodity in Tajikistan. However, despite improved cotton yields, output value dropped because of declining international prices for cotton. Moreover, cotton farms accumulated substantial debts to creditors. This period of rapid changes makes the analysis of the process of poverty mobility among rural households very interesting.

This paper uses the panel component of two surveys conducted in Tajikistan at an interval of one year to explore the major determinants of the transition of households out of (or into) poverty. Household poverty status is measured in the asset space which, compared to a welfare measure based on consumption, provides a better indication of structural poverty transition. In addition to analysing the determinants of poverty transitions at the household level, we also look at the correlates of poverty at the district (*rayon*) level. The findings have important implications, which are briefly discussed below.

First, several household-level factors emerge as key predictors of poverty transition, suggesting the importance of continued investments to improve human capital outcomes. The odds for exiting poverty increase with the higher level of education and improved health status of the household head, as well as with the higher ratio of adults in wage employment. The risk of falling into poverty declines with a higher share of working-age people in the household and a larger share of adults working in public administration.

The district-level data suggest that areas where cotton farming has a more prominent role are likely to have higher levels of poverty. The analysis of poverty mobility at the household level also indicates that households located in cotton-producing areas do *not* enjoy better odds of climbing out of poverty. The analysis actually reveals that having a higher share of land under cotton cultivation in the district increases the probability of falling into poverty. Moreover, there are indications that that living in a cotton-producing area located near to markets (or district centre) worsens the chances of escaping poverty. Furthermore, the accumulated debt of the cotton farms is estimated to present a substantial drawback in transiting out of poverty. These findings are disheartening, given the importance of cotton in Tajikistan's agricultural production, and the number of people employed in the sector. A new critical look at the cotton sector is needed by policymakers in order to understand why cotton production does not broadly benefit the population of the cotton-producing areas.

The rate of increase in the share of *dekhan* (private) farming in a district had little impact on poverty levels and poverty mobility. Examination of the poverty correlates at the district level indicates that lower poverty levels are associated with larger portions of arable land being transferred to *dekhan* (private) farms. However, the increase in this type of farming between 2000-04 showed no positive impact on poverty levels or poverty mobility. The analysis at the household level indicates that larger initial shares of private farming improve the odds of escaping poverty. Nevertheless, the rate of

increase in this type of farming has not yet improved the chances of mobility out of poverty. This is likely a reflection of the fact that land ownership transfers are often on paper only, and thus are not accompanied by improvements in farm productivity.

There is strong evidence of geographic poverty mobility traps. A higher level of poverty in a district significantly reduces the chances of a household of moving out of poverty. Living in a region with an overall slow economic growth rate is also found to undermine the odds of escaping poverty and increase the odds of falling into poverty. The risk of impoverishment significantly increases for households in regions that experienced drought. In other words, everything else being equal, the geographical location of a household matters considerably in terms of its chances of escaping or falling into poverty. It is worth noting that this observation regarding geographical poverty traps on the part of rural households in Tajikistan confirms numerous similar findings in other countries and settings, as in post-reform China (Jalan and Ravallion 2002).

References

Angel-Urdinola, D. F., C. Mete, and S. R. Cnobloch (2008). 'Poverty Dynamics in Tajikistan'. Washington, DC: World Bank. Manuscript.

Baschieri, A., and J. Falkingham (2005). 'Developing a Poverty Map of Tajikistan: A Technical Note'. S3RI Applications and Policy Working Papers, A05/11. Southampton: Southampton Statistical Sciences Research Institute.

Becerra, C. A. V. (2004). 'The World Cotton Market: A Long-Term Outlook'. Working Paper presented at the WTO African Regional Workshop on Cotton, 23-24 March, Cotonou.

Canto, O. (2002). 'Climbing Out of Poverty, Falling Back in: Low Income Stability in Spain'. *Applied Econometrics*, 34 (15): 1903-16.

Carter, M. R., and J. May (2001). 'Poverty, Livelihood and Class in Rural South Africa'. *World Development*, 27 (1): 1-20.

Carter, M. R., and B. C. Barrett (2006). 'The Economics of Poverty Traps and Persistent Poverty: An Asset-Based Approach'. *Journal of Development Studies*, 42 (2): 178-99.

Filmer, D., and L. Pritchett (1998). 'Estimating Wealth Effects without Income or Expenditure Data'. WB Policy Research Paper 1994. Washington, DC: World Bank.

Jalan, J., and M. Ravallion (2002). 'Geographic Poverty Traps? A Micro Model of Consumption Growth in Rural China'. *Journal of Applied Econometrics*, 17: 329-46.

Lawley, D., and A. Maxwell (1971). *Factor Analysis as a Statistical Method*. London: Butterworth & Co.

Sahn, D., and D. Stifel (2000). 'Poverty Comparisons over Time and across Countries in Africa'. *World Development*, 28 (1): 2123-55.

Sahn, D., and D. Stifel (2003). 'Exploring Alternative Measures of Wealth in the Absence of Expenditure Data'. *The Review of Income and Wealth*, 49 (4): 463-89.

World Bank (2005). 'Priorities for Sustainable Growth: A Strategy for Agriculture Sector Development in Tajikistan'. Washington, DC: World Bank. Mimeo

World Bank (2006). 'Republic of Tajikistan Poverty Assessment Update'. Report No. 30853-TJ. Washington, DC: World Bank.

Ukaeva, U. (2005). 'Decomposition of Agricultural Growth in Tajikistan'. Washington, DC: World Bank. Mimeo.

Appendix Table 1
Determinants of the transition out of, and into, poverty for rural households (probit model)
(with no community characteristics)

	A		B		C		D	
	move-out poverty		**move-into poverty**		**move-out poverty**		**move-into poverty**	
Variable	**dF/dx**	**std. err.**	**dF/dx**	**std. err.**	**dF/dx**	**std. err.**	**dF/dx**	**std. err.**
The gap bwn 2003 asset index and the pov. line	0.288*	*0.164*	-0.082***	*0.026*	0.277*	*0.167*	-0.082***	*0.026*
Household (HH) head characteristics								
Age of HH head, years	0.012	*0.016*	0.005	*0.018*	0.018	*0.016*	0.006	*0.018*
Age of HH head squared (/100), years	-0.007	*0.015*	-0.002	*0.017*	-0.013	*0.015*	-0.003	*0.017*
HH head education = secondary	0.066	*0.085*	0.072	*0.096*	0.027	*0.088*	0.065	*0.097*
HH head education = university	0.294**	*0.128*	-0.038	*0.122*	0.265**	*0.132*	-0.056	*0.121*
HH head is female	0.028	*0.090*	0.049	*0.097*	0.034	*0.091*	0.074	*0.100*
HH head health > average	0.189*	*0.102*	0.096	*0.105*	0.210*	*0.104*	0.104	*0.104*
HH head health = average	0.111	*0.121*	-0.028	*0.119*	0.128	*0.125*	-0.035	*0.119*
Demographics and employment of HH members								
HH size	0.075*	*0.041*	-0.052**	*0.027*	0.068*	*0.042*	-0.048*	*0.027*
HH size squared	-0.004	*0.002*	0.002**	*0.001*	-0.003	*0.002*	0.002*	*0.001*
Share of adults in the HH	0.018	*0.151*	-0.576***	*0.168*	0.003	*0.154*	-0.550***	*0.172*
Share of adults in hired (wage) employment	0.148	*0.111*	0.013	*0.138*	0.193*	*0.115*	0.027	*0.139*
Share of adults working in agriculture	0.038	*0.090*	0.010	*0.097*	0.070	*0.092*	-0.013	*0.099*
Share of adults working in health/educ./public admin.	-0.010	*0.268*	-0.510*	*0.304*	0.039	*0.270*	-0.552***	*0.308*
Region (oblast) dummies								
Oblast = GBAO	0.031	*0.095*	-0.037	*0.095*	0.054	*0.099*	-0.066	*0.099*
Oblast = Sugd	0.120	*0.079*	0.062	*0.097*	-0.067	*0.105*	0.071	*0.154*
Oblast = RRS	-0.166*	*0.078*	0.087	*0.093*	-0.284**	*0.095*	0.062	*0.124*
District (rayon) characteristics								
Poverty headcount in rayon, %					-0.008*	*0.004*	0.001	*0.003*
% of farming land which is irrigated					0.008	*0.018*	-0.008	*0.016*
% of farming land which is irrigated (^2/100)					-0.009	*0.012*	0.006	*0.012*
Cotton is produced in rayon					0.083	*0.088*	-0.192*	0.105
Number of observations		322		267		322		267
chi2		42.264		45.836		51.668		50.474
Log-Likelihood		-187.53		-148.38		-182.83		-146.07
Pseudo R2		0.101		0.134		0.124		0.147
note: .01 - ***; .05 - **; .1 - *; dF/dx indicates the estimated marginal effect (at the mean for continuous variable, and 0/1 change for dummy variable)								

Source: Authors' estimates, based on 2003 LSMS and 2004 EHS.

Appendix Table 2
Determinants of the transition out of, and into, poverty for rural households (probit model)
(with community characteristics and 'cotton' variable interactions)

	A		B		C		D	
	move-out poverty		move-into poverty		move-out poverty		move-into poverty	
Variable	**dF/dx**	**std. err.**	**dF/dx**	**std. err.**	**dF/dx**	**std. err.**	**dF/dx**	**std. err.**
The gap bwn 2003 asset index and the pov. line	0.294*	0.169	-0.084***	0.027	0.296*	0.170	-0.081***	0.027
Household (HH) head characteristics								
Age of HH head, years	0.020	0.017	0.007	0.018	0.021	0.017	0.009	0.018
Age of HH head squared (/100), years	-0.015	0.016	-0.003	0.017	-0.016	0.016	-0.005	0.017
HH head education = secondary	0.036	0.088	0.062	0.098	0.053	0.103	0.129	0.103
HH head education = university	0.248*	0.134	-0.052	0.122	0.232*	0.159	0.063	0.149
HH head is female	0.021	0.092	0.050	0.098	0.052	0.124	0.106	0.113
HH head health > average	0.212*	0.104	0.106	0.104	0.217*	0.109	0.125	0.105
HH head health = average	0.107	0.126	-0.040	0.120	0.129	0.134	-0.009	0.127
Demographics and employment of HH members								
HH size	0.071*	0.042	-0.056**	0.027	0.067	0.042	-0.060**	0.028
HH size squared	-0.003	0.002	0.002**	0.001	-0.003	0.002	0.003**	0.001
Share of adults in the HH	-0.003	0.155	-0.579***	0.171	0.002	0.159	-0.604***	0.171
Share of adults in hired (wage) employment	0.195*	0.115	0.044	0.144	0.216*	0.120	-0.007	0.148
Share of adults working in agriculture	0.065	0.092	0.019	0.100	0.102	0.103	0.094	0.106
Share of adults working in health/education/public admin.	0.067	0.273	-0.586*	0.315	0.093	0.276	-0.539*	0.330
Region (oblast) dummies								
Oblast = GBAO	0.069	0.105	-0.025	0.114	0.053	0.109	-0.072	0.111
Oblast = Sugd	-0.098	0.102	0.051	0.166	-0.165	0.107	-0.002	0.163
Oblast = RRS	-0.318***	0.084	0.155	0.130	-0.343***	0.080	0.153	0.130
District (rayon) characteristics								
Poverty headcount in rayon, %	-0.009**	0.004	0.004	0.004	-0.011**	0.004	0.004	0.004
% of farming land which is irrigated	0.001	0.018	0.008	0.017	0.005	0.019	-0.000	0.018
% of farming land which is irrigated (^2/100)	-0.003	0.012	-0.006	0.012	-0.007	0.013	-0.001	0.012
Community characteristics								
Size of the population point, '000 people	0.003	0.005	0.001	0.006	0.004	0.005	-0.001	0.006
Less rain compared to last year	-0.028	0.144	0.288*	0.178	-0.030	0.144	0.286*	0.179
Distance to the nearest market, km.	-0.002	0.004	-0.001	0.004	-0.002	0.004	-0.001	0.004
Cotton is produced in the area ("cotton" community)	0.071	0.083	-0.004	0.115	0.097	0.177	0.561*	0.257
Interactions of the "cotton" community variable								
"Cotton" community & distance to the market					0.018	0.016	-0.002	0.027
"Cotton" community & Share of HH adults working in agriculture					-0.160	0.206	-0.504*	0.306
"Cotton" community & HH head education = secondary					-0.045	0.141	-0.206	0.157
"Cotton" community & HH head education = university					0.203	0.342	-0.300	0.059
"Cotton" community & HH head is female					-0.100	0.167	-0.222	0.121
Number of observations		322		267		322		267
chi2		53.152		50.251		55.976		56.303
Log-Likelihood		-182.09		-146.18		-180.67		-143.15
Pseudo R2		0.127		0.147		0.134		0.164
note: .01 - ***; .05 - **; .1 - *; dF/dx indicates the estimated marginal effect (at the mean for continuous variable, and 0/1 change for dummy variable)								

Source: Authors' estimates, based on 2003 LSMS and 2004 EHS.

Appendix Table 3
Determinants of the transition out of, and into, poverty for rural households in cotton-producing districts (probit model)
(with community characteristics and 'cotton variable interactions)

	A		B		C		D	
	move-out poverty		move-into poverty		move-out poverty		move-into poverty	
Variable	dF/dx	std. err.	dF/dx	std. err.	dF/dx	std. err.	dF/dx	std. err.
The gap bwn 2003 asset index and the pov. line	0.559**	0.228	-0.148***	0.040	0.623***	0.233	-0.168***	0.042
Household (HH) head characteristics								
Age of HH head, years	0.021	0.021	0.004	0.019	0.022	0.021	0.008	0.019
Age of HH head squared (/100), years	-0.016	0.019	-0.004	0.018	-0.016	0.020	-0.006	0.018
HH head education = secondary	0.164	0.096	-0.093	0.127	0.200*	0.110	-0.016	0.129
HH head education = university	0.437***	0.152	-0.240*	0.089	0.430**	0.196	-0.128	0.135
HH head is female	0.122	0.115	-0.006	0.106	0.080	0.155	0.013	0.122
HH head health > average	0.142	0.122	0.022	0.136	0.125	0.128	0.017	0.138
HH head health = average	-0.020	0.140	-0.105	0.132	-0.014	0.149	-0.074	0.141
Demographics and employment of HH members								
HH size	0.062	0.053	-0.028	0.051	0.061	0.053	-0.039	0.052
HH size squared	-0.003	0.003	0.001	0.003	-0.002	0.003	0.002	0.003
Share of adults in the HH	0.039	0.197	-0.476**	0.218	-0.024	0.207	-0.552**	0.216
Share of adults in hired (wage) employment	0.151	0.142	-0.066	0.198	0.194	0.152	-0.132	0.203
Share of adults working in agriculture	0.125	0.114	0.009	0.135	0.222	0.145	0.128	0.142
Region (oblast) dummies								
Oblast = GBAO	-0.088	0.119	0.113	0.157	-0.104	0.126	0.057	0.155
Oblast = Sugd	0.085	0.201	-0.344	0.102	-0.204	0.190	-0.305	0.115
Oblast = RRS	-0.286**	0.088	0.400**	0.180	-0.274*	0.094	0.410**	0.185
District (rayon) characteristics								
% of farming land which is irrigated	0.137	0.133	-0.331***	0.128	0.166	0.144	-0.301**	0.127
% of farming land which is irrigated (^2/100)	-0.087	0.083	0.205**	0.080	-0.111	0.091	0.184**	0.080
% of total arable land under cotton	-0.002	0.004	0.010***	0.003	-0.003	0.004	0.010***	0.003
Cotton farm debt (per hectare of land under cotton)	-0.363	0.275	0.348	0.275	-0.681**	0.325	0.199	0.278
% of arable land under dekhan farms, 2000	0.011	0.008	0.001	0.010	0.020**	0.009	0.011	0.011
% point change in the share of land under dekhan farms, 2000-2004	0.000	0.002	-0.001	0.003	0.000	0.003	0.001	0.003
Community characteristics								
Size of the population point, '000 people	-0.003	0.011	0.032**	0.016	-0.003	0.011	0.031*	0.016
Distance to the nearest market, km.	0.003	0.006	-0.013**	0.006	0.005	0.006	-0.014**	0.005
Interactions of the "cotton" community variable								
"Cotton" community & distance to the market					0.052**	0.024	0.060*	0.033
"Cotton" community & Share of HH adults working in agriculture					-0.267	0.242	-0.743*	0.447
"Cotton" community & HH head education = secondary					-0.073	0.153	0.014	0.249
"Cotton" community & HH head education = university					0.123	0.385	-0.23	0.072
"Cotton" community & HH head is female					0.072	0.237	-0.080	0.207
Number of observations		217		167		217		167
chi2		44.996		41.685		52.267		46.747
Log-Likelihood		-115.39		-83.51		-111.76		-80.98
Pseudo R2		0.163		0.200		0.190		0.224

note: .01 - ***; .05 - **; .1 - *; dF/dx indicates the estimated marginal effect (at the mean for continuous variable, and 0/1 change for dummy variable)

Source: Authors' estimates, based on 2003 LSMS and 2004 EHS.