Migration Responses to Household Income Shocks: Evidence from Kyrgyzstan

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Research Question

How do income shocks influence employment decisions and food security?

- What are their impacts on migration and whether individuals work?
- Do remittances compensate for losses?
- Do they influence the acquisition of human capital?
- What are the the impacts on consumption and dietary diversity?

Specific Focus: Households in Kyrgyzstan Earning Income from Agriculture

During 2004-2014, how have Kyrgyz households earning income from agricultural production (crops and/or livestock) responded to reductions in total household income?

Preview of the Results

- Negative household income shocks significantly increase migration—especially international migration
  - Migration impacts on women are smaller than for men
  - Women are more likely to lose their jobs than are men following shocks
- Migratory responses materialize quickly; most migration induced by an income shock occurs in the same year as the shock, and the shock's effect in the next year is only about 60 percent of its initial size.
- Remittances to the origin come with a lag; migrants may first need time to find reliable employment or pay off costs of migration.
- Shocks do not affect whether youth pursue non-compulsory education
- Negative shocks reduce dietary diversity

Motivation

- Negative income shocks can substantially negatively affect the welfare of the poor
  - For example, they increase child labor and reduce the likelihood of investment in relatively capital-intensive HH enterprises (Yang 2008)
- Households—especially poor ones—tend to under-insure against such shocks (Dercon 2002; Townsend 1994; Jalan and Rvallion 1999)
- The effect of negative income shocks on migration is ambiguous:
  - They increase liquidity constraints (making it harder to finance migration and thus reducing it)
  - They increase the need for family members to stay home to help cope with the shock (reducing migration) (Halliday 2006)
  - They increase wage gaps between the origin and potential destinations (increasing migration) (Kennan and Walker 2011; Kleemans 2015)
- Limited empirical evidence on how movements in HH income affect migration and employment or how women are differentially affected

Background: The Economy of Kyrgyzstan

- Small (200,000 sq. km), land-locked, low-income country in Central Asia
- 2004 GDP per capita: $757 (in constant 2010 USD); still a modest $1,004 per capita by 2014
- In 2014, 30.6% of people were living below the national poverty line
- 65% of the population, 75% of the poor, and 80% of the extreme poor live in rural areas (FAO 2016)

Background: The Agricultural Sector

- Only 7 percent of the country's land is arable (44 percent of land is used as pastures for livestock)
- Agriculture's share in GDP was 33 percent in 2004, though that declined to 17 percent in 2014
- 39% of employment in 2004 and 32% in 2014 was in agriculture
- Livestock accounted for over 57% of overall net production value of agriculture in 2011
- Vast majority of agricultural production is concentrated in small individual farms (FAO 2016)

Background: Migration in Kyrgyzstan

- Many Kyrgyz have emigrated—largely to Russia and to a lesser extent Kazakhstan—in search of improved economic opportunities
- An estimated 650,000–1,000,000 Kyrgyz, about 40 percent female and 60 percent male, currently work abroad (OSCE 2016)
- In 2014, migrants sent home over $2 billion in remittances—equivalent to over 27 percent of GDP
- This has contributed to making migration a major policy issue for the country

Data

- Data source: The Kyrgyzstan Integrated Household Survey (KIHS), 2004–2014 (11 years of data)
  - Rolling panel dataset; median household is in the sample for 3 years
  - Measures collected quarterly aggregated to be annual data
  - Household identifiers unique and consistent across years; individual identifiers constructed using household identifier and exact birth date (year, month, date)
- Sample: all households earning at least some income from agriculture (65.5 percent of households)
  - 9,562 households in total
  - 41 percent are urban
  - 41 percent of all income these households earn comes from agriculture

Outcomes

Migration:

- Defined as exiting the household roster (and thus ceasing to be considered a household member) (used, e.g., by Mueller et al. 2014)

Employment:

- Defined as having worked for a paid job and/or for a family farm or enterprise during the last week (or being temporarily away)

Pursuing Education:

- Is the individual currently a student?

Table 1: Summary statistics

	N	Mean	SD
Dummy—individual left roster since the previous round	62,282	0.103	0.304
Dummy—main place of work is outside the country	71,719	0.087	0.282
Dummy—main place of work is outside the oblast or country	71,719	0.124	0.330
Dummy—had a paid job and/or work on a family farm or enterprise	103,321	0.694	0.461
Dummy—worked multiple jobs in last week	71,719	0.151	0.358
Dummy—would like to work more, if it provided additional income	71,719	0.284	0.451
Dummy—employed under verbal contract	36,616	0.401	0.490
Dummy—student (universe: 15-24 years)	35,596	0.570	0.495
Dummy—student (universe: 15-20 years)	25,159	0.738	0.440
Assistance per capita from family and friends (2010 Som)	33,209	2,052	6,113
Healthy HH dietary diversity score	28,660	1.956	.647
Household dietary diversity score	28,660	9.214	1.088
Total household income (2010 Som)	9,551	128,773	118,259
Dummy—household produces an ag good in the majority of traded value basket	9,562	0.735	0.441
Head of household age	9,367	51.7	14.0
Household size	9,369	4.38	1.93
Land size (1000 m^2)	9,550	9.15	14.6
Dummy—head of household general secondary degree or higher	9,367	0.851	0.356
Dummy—head of household is married	9,367	0.729	0.445
Dummy—head of household is male	9,367	0.726	0.446

Source: Authors' calculations based on KIHS 2004–2014.

Notes: Household characteristics are summarized for the first (initial) year that the household is in the sample.

Econometric Specification

- We estimate:

$$E_{ijkt} = \beta_0 + \beta_1 H_{jkt} + \boldsymbol{\beta_2 X_{jkt}} + \boldsymbol{\beta_3 Y_{ijkt}} + \alpha_{kt} + \gamma_t + \boldsymbol{t_{jk}} + \epsilon_{ijkt} \quad (1)$$

where

  - i indexes individuals, j indexes households, k indexes the oblast (i.e. region) – area type (rural or urban), and t indexes years
  - E_{ijkt} is a migration or employment-related outcome
  - H_{jkt} is total household income
  - $\boldsymbol{X_{jkt}}$ is a vector of household-level controls
  - $\boldsymbol{Y_{ijkt}}$ is a vector of individual-level controls including a male dummy, age, and age^2
  - α_{kt} are year $\times$ oblast $\times$ urban area dummy fixed effects
  - γ_t are year fixed effects
  - $\boldsymbol{t_{jk}}$ is a vector of the quantities the HH grew in its first year in the sample of 6 most traded ag products, each interacted with a time trend

Identification: Simulated Instrumental Variables Strategy

- Problem: Omitted variable bias and reverse causality
- Solution: Instrument for HH income with simulated (i.e. predicted) HH income from a basket of the six most traded (by value) ag products (kidney beans, cow's milk, sheep, cows, bulls/ oxen, and potatoes):

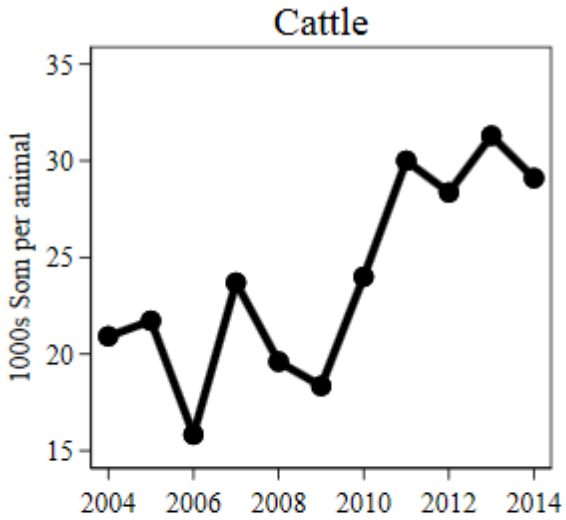
$$S_{jkt} = \sum_{c=1}^{6} (q_{c,t=0} \times p_{c,t})$$

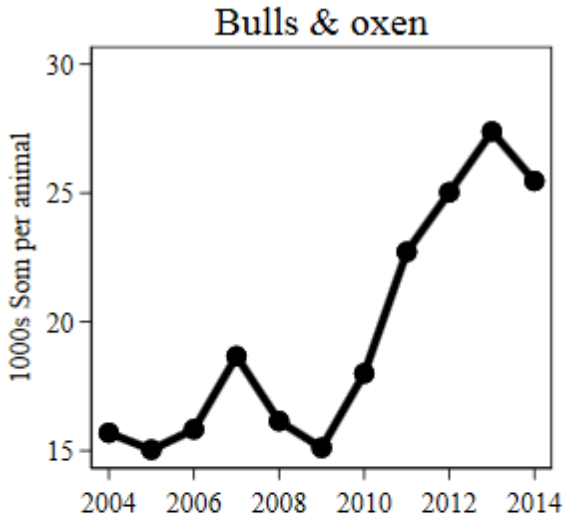
  - $q_{c,t=0}$ is quantity HH produced in its first year in the sample
  - $p_{c,t}$ is Kyrgyzstan-wide median price in the *current year*
  - Note: About 74% of sample households produced at least one of these products in their first year in the sample.
- Exploits that part of HH income due to exogenous shifts in prices of heavily-traded commodities

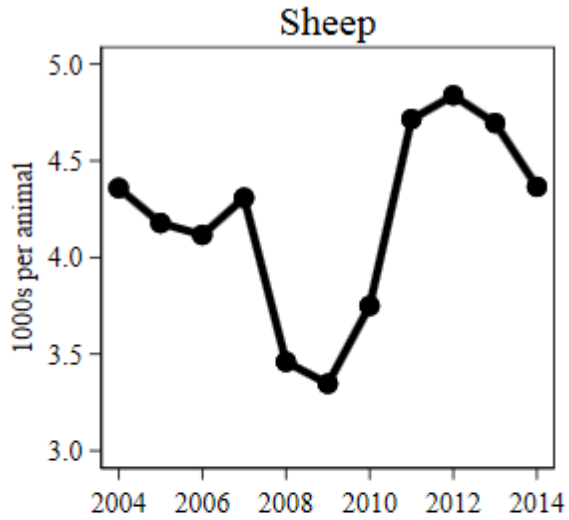
Identification: Example

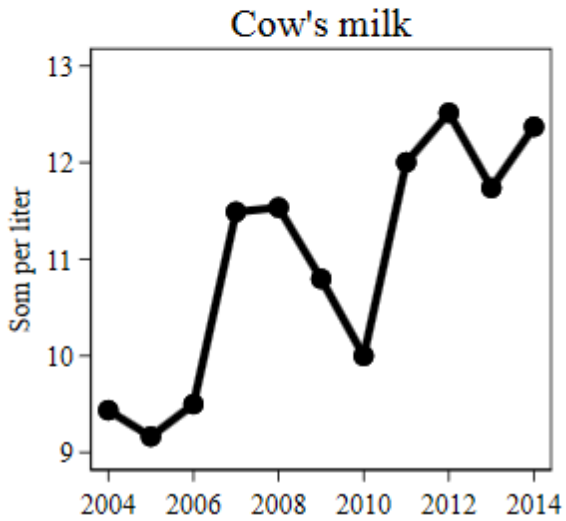
- Suppose that in 2004 (initial year), two households (A and B) both earn $ 5,000 in income and $3,000 of it from agriculture, but:
  - HH A earns ag income from kidney beans, selling 3,000 kg at $1/ kg
  - HH B earns ag income from selling 20 sheep at $150 each
- In 2004, the value of the instrument is:
  - For HH A: $\$1 \times 3{,}000 = \$3{,}000$
  - For HH B: $\$150 \times 20 = \$3{,}000$
- Suppose that in 2005, the median price of kidney beans in Kyrgyzstan falls by half but the price of sheep doubles; we expect HH A to suffer and B to gain
- The value of our instrumental variable in 2005 will reflect this:
  - For HH A: $\$0.50 \times 3{,}000 = \$1{,}500$
  - For HH B: $\$300 \times 20 = \$6{,}000$
- Note: We keep quantities the same (even if farmers change them in response to new prices!); the instrument thus reflects only exogenous price shocks, not (endogenous) HH decisions

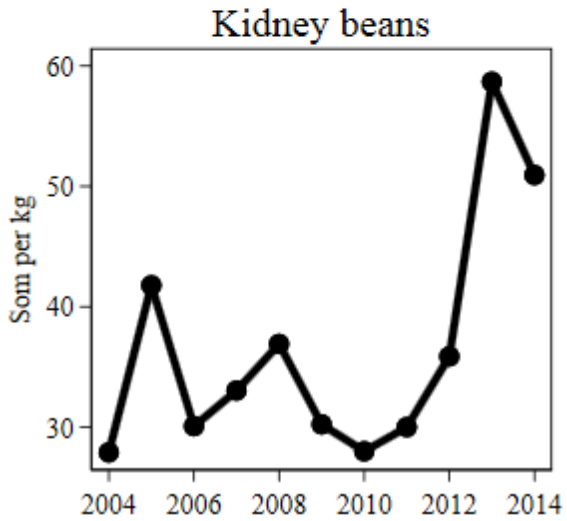
Basket prices











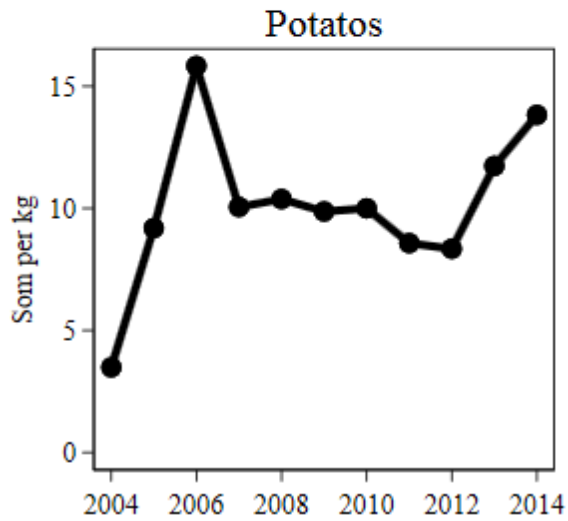


Table 2: First stage results

	(1)	(2)	(3)	(4)	(5)
Controls added iteratively					
Year FE	Yes	Yes	Yes	Yes	Yes
Year×urban×oblast FE		Yes	Yes	Yes	Yes
Household-level controls			Yes	Yes	Yes
Individual's age, age^2, and sex				Yes	Yes
Other individual-level controls					Yes
Panel A: current income					
Simulated income	1.177***	1.132***	1.143***	1.145***	1.141***
	(0.104)	(0.102)	(0.100)	(0.100)	(0.100)
R^2	0.377	0.442	0.463	0.464	0.466
First stage F-stat	127.1	124.1	129.8	130.6	130.0
N	62240	62240	61401	61401	61401
Panel B: lagged income					
Simulated income	0.934***	0.936***	0.951***	0.951***	0.947***
	(0.114)	(0.116)	(0.119)	(0.119)	(0.119)
R^2	0.527	0.576	0.592	0.592	0.594
First stage F-stat	66.7	65.6	64.1	64.1	63.8
N	60695	60695	59858	59858	59858

Source: Authors' calculations based on KIHS 2004–2014.

Notes: Standard errors are in parentheses and clustered at the household level. *** indicates p<0.01; ** indicates p<0.05; and * indicates p<0.10.

Table 3: Effects of income shocks on migration: OLS

	(1)	(2)	(3)	(4)	(5)
Controls added iteratively					
Year FE	Yes	Yes	Yes	Yes	Yes
Year×urban×oblast FE		Yes	Yes	Yes	Yes
Household-level controls			Yes	Yes	Yes
Individual's age, age^2, and sex				Yes	Yes
Other individual-level controls					Yes
Panel B: OLS estimates using current year income					
Income	0.000	-0.004**	-0.007***	-0.009***	-0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
R^2	0.012	0.025	0.032	0.089	0.105
N	62,240	62,240	61,401	61,401	61,401
Panel D: OLS estimates using lagged income					
Income	0.008***	0.003*	0.001	-0.002	-0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
R^2	0.012	0.025	0.032	0.090	0.105
N	60,695	60,695	59,858	59,858	59,858

Source: Authors' calculations based on KIHS 2004–2014.

Notes: Income is measured in 100,000s of 2010 Som. Standard errors are in parentheses and clustered at the household level. *** indicates p<0.01; ** indicates p<0.05; and * indicates p<0.10.

Table 4: Effects of income shocks on migration: IV

	(1)	(2)	(3)	(4)	(5)
Controls added iteratively					
Year FE	Yes	Yes	Yes	Yes	Yes
Year×urban×oblast FE		Yes	Yes	Yes	Yes
Household-level controls			Yes	Yes	Yes
Individual's age, age^2, and sex				Yes	Yes
Other individual-level controls					Yes
Panel A: IV estimates using current year income					
Income	-0.026**	-0.038***	-0.035***	-0.031***	-0.034***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
R^2	0.006	0.015	0.025	0.085	0.100
First stage F-stat	127.1	124.1	129.8	130.6	130.0
N	62,240	62,240	61,401	61,401	61,401
Panel C: IV estimates using lagged income					
Income	-0.018	-0.025*	-0.017	-0.017	-0.020
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
R^2	0.008	0.020	0.030	0.088	0.103
First stage F-stat	66.7	65.6	64.1	64.1	63.8
N	60,695	60,695	59,858	59,858	59,858

Source: Authors' calculations based on KIHS 2004–2014.

Notes: Income is measured in 100,000s of 2010 Som. Standard errors are in parentheses and clustered at the household level. *** indicates p<0.01; ** indicates p<0.05; and * indicates p<0.10.

Table 5: Effects of income shocks on assistance from friends or relatives

	(1)	(2)	(3)
Controls added iteratively			
Year FE	Yes	Yes	Yes
Year×urban×oblast FE		Yes	Yes
Household-level controls			Yes
Panel A: current year income			
Income	1,761***	1,154*	787
	(657)	(658)	(652)
Observations	34,837	34,785	34,213
R^2	0.007	0.034	0.039
First stage F stat	151	152.3	156.9
Panel B: lagged income			
Income	-714	-1,344	-1,601*
	(926)	(939)	(946)
Observations	25,308	25,308	24,895
R^2	0.005	0.031	0.032
First stage F stat	79.68	80.02	80.95

Source: Authors' calculations based on KIHS 2004–2014.

Notes: Assistance from friends or relatives in measured in 2010 Som. Income is measured in 100,000s of 2010 Som. Standard errors are in parentheses and clustered at the household level. *** indicates $p<0.01$; ** indicates $p<0.05$; and * indicates $p<0.10$.

Table 6: Effects of income shocks on migration

	Dummy—left household		Dummy—main place of work is outside the country		Dummy—main place of work is outside the oblast or country	
	(1)	(2)	(3)	(4)	(5)	(6)
Income	-0.034***	-0.025**	-0.026**	-0.010	-0.013	0.006
	(0.012)	(0.012)	(0.012)	(0.013)	(0.014)	(0.014)
Income×male		-0.017***		-0.025***		-0.030***
		(0.004)		(0.003)		(0.003)
R^2	0.100	0.100	0.135	0.132	0.141	0.138
First stage F-stat	130.0	65.3	105.0	52.7	105.0	52.7
N	61401	61401	70416	70416	70416	70416

Source: Authors' calculations based on KIHS 2004–2014.

Notes: Income is measured in 100,000s of 2010 Som. Standard errors are in parentheses and clustered at the household level. *** indicates p<0.01; ** indicates p<0.05; and * indicates p<0.10.

Table 7: Effects of income shocks on employment

	Dummy—had a paid job and/or work on a family farm or enterprise	
	(1)	(2)
Income	0.037***	0.051***
	(0.014)	(0.014)
Income×male		-0.026***
		(0.005)
R^2	0.294	0.292
First stage F-stat	117.0	58.6
N	101433	101433

Source: Authors' calculations based on KIHS 2004–2014.
Notes: Income is measured in 100,000s of 2010 Som. Standard errors are in parentheses and clustered at the household level. *** indicates p<0.01; ** indicates p<0.05; and * indicates p<0.10.

Table 8: Effects of income shocks on employment choices

	Dummy—worked multiple jobs in last week		Dummy—would like to work more, if it provided additional income		Dummy—employment under verbal contract	
	(1)	(2)	(3)	(4)	(5)	(6)
Income	0.056***	0.043***	-0.010	-0.020	0.026	0.023
	(0.016)	(0.016)	(0.023)	(0.023)	(0.027)	(0.029)
Income×male		0.022***		0.015***		0.005
		(0.006)		(0.005)		(0.010)
R^2	0.127	0.127	0.111	0.111	0.182	0.182
First stage F-stat	105.0	52.7	105.0	52.7	93.2	46.7
N	70416	70416	70416	70416	36190	36190

Source: Authors' calculations based on KIHS 2004–2014.

Notes: Income is measured in 100,000s of 2010 Som. Standard errors are in parentheses and clustered at the household level. *** indicates p<0.01; ** indicates p<0.05; and * indicates p<0.10.

Table 9: Effects of income shocks on studying

	Dummy—student...			
	(universe: 15–24 years)		(universe: 15–20 years)	
	(1)	(2)	(3)	(4)
Income	0.000	-0.001	-0.011	-0.010
	(0.020)	(0.021)	(0.023)	(0.024)
Income×male		0.002		-0.001
		(0.008)		(0.008)
R^2	0.480	0.480	0.351	0.351
First stage F-stat	79.3	39.9	57.3	29.0
N	34,931	34,931	24,702	24,702

Source: Authors' calculations based on KIHS 2004–2014.

Notes: The student outcomes are constructed from the self-reported response to "Please specify which of the following definitions is the best description of your current status?" Income is measured in 100,000s of 2010 Som. Standard errors are in parentheses and clustered at the household level. *** indicates $p<0.01$; ** indicates $p<0.05$; and * indicates $p<0.10$.

Table 10: Effects of income shocks on dietary diversity

	HDDS (1)	Healthy HDDS (2)
Income	0.136***	0.062**
	(0.049)	(0.029)
R^2	0.448	0.423
First stage F-stat	190.8	190.8
N	28,231	28,231

Source: Authors' calculations based on KIHS 2005–2014.
Notes: The household dietary diversity score (HDDS) is constructed by counting the number of the 12 total food categories have been consumed in the last 2 weeks. A "healthy" HDDS is constructed similarly by counting the number of categories a household consumes from: fruits, pulses/legumes/nuts, vegetables, and fish/seafood. Income is measured in 100,000s of 2010 Som. Standard errors are in parentheses and clustered at the household level. *** indicates p<0.01; ** indicates p<0.05; and * indicates p<0.10.

Conclusion

- Negative household income shocks significantly increase migration—especially international migration
  - Migration impacts on women are smaller than for men
  - Women are more likely to lose their jobs than are men following shocks
- Migratory responses materialize quickly; most migration induced by an income shock occurs in the same year as the shock, and the shock's effect in the next year is only about 60 percent of its initial size.
- Remittances to the origin come with a lag; migrants may first need time to find reliable employment or pay off costs of migration.
- Shocks do not affect whether youth pursue non-compulsory education
- Negative shocks reduce dietary diversity