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# Temporary international migration, shocks and informal finance: analysis using panel data

## Abstract

We examine households' temporary international migration response when faced with shocks in rural Kyrgyzstan. Using a household fixed effects model, we find that while a drought shock increases migration, a winter shock reduces migration. We argue that this difference is because of the trade-off between two effects of a shock for a household: loss of income and increase in the need for labor services. Migration increases when the former effect of a shock dominates and it reduces when the latter effect dominates. We explore these mechanisms further, and find that when households have easier access to informal finance the migration response is muted only for shocks for which the adverse income effect dominates. These findings provide evidence in favor of our proposed mechanisms through which shocks affect migration.

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# 1 Introduction

There is a large literature that examines the causes and consequences of international migration.[1] However, one aspect with regards to temporary international migration has received less attention.[2] Except Halliday (2006), no other study distinguishes between different types of shocks faced by households that affect their temporary international migration decision. While past studies have examined the effects of agricultural shocks (Kubik and Maurel, 2016; Dillon et al., 2011; Giannelli and Canessa, 2022), direct income shocks (Angelucci, 2015), and weather shocks (Gröger and Zylberberg, 2016) in isolation, they do not distinguish between the effects of various types of shocks on the migration decision. This distinction is important as the decision to migrate in response to a shock may depend on the nature of the shock. We fill this gap in the literature.

We examine the migration response of households to different types of natural shocks and provide evidence on potential mechanisms driving the effects. We use a unique household panel data from the Life in Kyrgyzstan (LiK) surveys, which allows us to observe the dynamics of temporary migration (LIK, 2010/2013) at the household level. The LiK surveys provide a nationally representative panel data comprising about 3,000 households in Kyrgyzstan. We use data from four waves of the survey (2010–2013). To our knowledge, the LiK survey data is the only panel data available for a low income source country that allows for tracking and analyzing temporary international migration decisions of households.[3] The longitudinal nature of the LiK data allows us to use a household-specific fixed effects (FE) model to address the issue of unobserved heterogeneity in migration decisions (McKenzie et al., 2010). Further, to our knowledge, the LiK data has only been utilized by two other studies to study international migration – Chakraborty et al. (2015) and Zhunusova and Herrmann (2018). The former uses the 2010 and 2011 waves of the data to examine the consequences of migration on private transfers between households in Kyrgyzstan. The latter uses the panel between 2010 and 2013 to study the impact of migration on income in the sending community.

We use the information on whether a household was affected by one of five natural shocks – drought, rain and landslide, winter and frost, earthquake, and pest. We restrict our analysis to natural shocks as they are most likely to be exogenous to a household's migration decision. Further, given that weather shocks are more likely to affect the livelihoods of rural households, we restrict our analysis to households residing in villages.

We begin our analysis by estimating the effect of each shock on a household's decision to have a migrant. We find that while receiving a drought shock in the last period increases the likelihood of migration, winter shocks reduce the likelihood of migration.[4] However, we do not find evidence that the other three shocks we consider affect the decision to migrate. We then analyze the decision to migrate and control for various household characteristics in our baseline specification. Consistent with previous studies, we find that the likelihood of migration is

1 See Kerr and Kerr (2011) and Gaston and Nelson (2013) for reviews of the literature. A large number of studies examining the determinants of migrants have used data for migrants from Mexico to the U.S. These studies include Chiquiar and Hanson (2005), Ibarraran and Lubotsky (2007), Mishra (2007), Mckenzie and Rapoport (2010), Vincenzo (2011), and Kaestner and Malamud (2014) among others.

2 See Christian and Görlach (2016) for a review of the literature on temporary international migration.

3 For details on the LiK survey data see Brück and Esenaliev (2014).

4 While most previous studies in the literature find an increase in migration in response to shocks, Halliday (2006) finds that adverse agricultural conditions increase net migration while earthquakes reduce net migration from El Salvador to the United States. Our findings of differences in effects of shocks for Kyrgyzstan are similar to these results.

positively related to household size, fraction of adults, and wealth of the household [see, e.g., Kaestner and Malamud (2014)]. Importantly, we find that the estimated coefficients for the shocks remain unaffected by the inclusion of these covariates.

When examining temporary migration, an important distinction is between the decision to send a migrant and to recall a migrant. The longitudinal nature of the LiK data allows for examining these dynamics of temporary migration and evaluate whether the effect of shocks on the two decisions depends on the nature of the shock. For analyzing the effect of shocks on recalling a migrant, we compare two households that both have a migrant in the current period and study the change in their migrant status in the next period. Analogously, for analyzing the effect of shocks on a household's decision to send a migrant, we compare two households that do not have a migrant in the current period and one of them switches to be a migrant in the next period. We find that while a drought shock affects the decision to send a migrant, a winter shock does not affect this decision. Even though the effect of winter shocks on the recall decision is large and positive, it is imprecisely estimated.

To understand why the migration response to these shocks differ, we explore the underlying mechanisms. We argue that depending on the nature of income generating activities that households are engaged in, local labor markets, and liquidity constraints faced by a household, a natural shock might reduce or increase migration. For instance, a drought shock is likely to reduce income for rural households that are largely engaged in agricultural activities. Migration, in such a situation, helps affected households to mitigate the adverse income effect of the shock (Morten, 2016). On the other hand, a potential explanation for the migration-lowering effects of winter shocks could be that colder months lead to an adverse labor situation by increasing the need for household labor in rural Kyrgyzstan. For instance, we find that time spent on various labor-intensive household activities is much higher in colder months than in milder months.

We examine the mechanisms driving different responses to different shocks by studying a household's access to informal finance. It is well established that in the absence of financial markets, rural households use informal networks to insure against income shocks (Townsend, 1994).[5] Hence, the decision to migrate in response to a shock is likely to depend on the extent to which households can mitigate the adverse income effects using their access to alternate sources of finance. For example, Morten (2019) examines the link between informal networks and domestic migration within India and finds that availability of informal finance reduces migration. We hypothesize that the availability of informal finance, controlling for household wealth, is likely to affect the migration response of shocks that adversely affect household income but not the migration response of shocks that affect the household's labor requirement. We use information on informal borrowing opportunities of households in the LiK data and find that access to finance reduces the likelihood of migration only for shocks that reduce incomes of households (drought shock) but not for shocks that increase the demand for labor service (winter shock). These findings provide support for our proposed mechanisms through which shocks affect the decision to migrate.

We contribute to the existing literature in two ways. First, with the exception of Halliday (2006), previous studies have focused on only one shock as a determinant of migration

5 A large literature examines the importance of informal networks in providing insurance in rural areas, see Morten (2019) for a brief review of the literature.

[see, e.g., Angelucci (2015), Dillon et al. (2011), and Gröger and Zylberberg (2016)]. Second, we discuss the underlying mechanisms that explain differences in the migration response of households to different shocks. We then empirically investigate these mechanisms and find evidence in support of the proposed mechanisms.

The rest of the paper is organized as follows. Section 2 discusses the data, and provides an overview of migration and shock experiences of households. Section 3 outlines the empirical specification that we use for our analysis. Section 4 reports our findings for the effects of shocks on the decision to migrate. Section 5 provides a discussion of the mechanisms driving the findings and empirically investigates the mechanisms. Finally, Section 6 provides a brief conclusion.

## 2 Data

We use four waves of the LiK survey, a panel data collected annually between 2010 and 2013. The survey was conducted in roughly 120 communities across the country and covers all provinces of Kyrgyzstan. We study the effects of weather and other natural shocks on a household's decision to have a migrant member. These shocks are more likely to affect the livelihoods of rural households predominantly employed in agriculture and related activities. Hence, we restrict our analysis to households that reside in villages. To do so, we follow Chakraborty et al. (2015) and use a variable in the data that provides information on whether a household resides in a city or village. The data consists of about 3,000 households, of which about 59% reside in villages.

We consider the decision to send a migrant to another country as a joint household decision. Accordingly, our outcome variable is the international migrant status of a household in a specific year. We construct this variable from the survey question that asks each household whether any of the household members lived in another country for more than 1 month (excluding business trips, vacations, and visits) during the last 12 months.[6] The migrant status is an indicator variable that takes on a value of 1 for households that have at least one member who lived in another country for more than 1 month during the last 12 months, and 0 otherwise. Table 1 provides the number of migrant and non-migrant households that reside in villages in each of the 4 years of the survey. The last column of the Table indicates that the percentage of households with migrants has gradually increased from 15% to 21% between 2010 and 2013.

**Table 1** Migrant and non-migrant households

| Year | Non-migrant | Migrant | Fraction migrant |
|---|---|---|---|
| 2010 | 1,513 | 271 | 0.152 |
| 2011 | 1,446 | 320 | 0.181 |
| 2012 | 1,438 | 341 | 0.192 |
| 2013 | 1,329 | 357 | 0.212 |

*Notes*: Households residing in villages were used in the analysis. Non-migrant refers to households who do not have any migrants in the reference period. Migrant refers to households with at least one migrant in the reference period. Fraction migrant is the fraction of migrant households in the reference period.

6 Based on the information available in the LiK data, more than 90% of the migrants from Kyrgyzstan go to Russia. While there were some requirements for workers to register in Russia, there was free mobility of workers between Central Asian countries and Russia over the period of our analysis.

The data also provide information on the month in which a migrant leaves home to go to another country. In Figure 1, we use this information to plot the percentage of migration in each month in 2010. The figure indicates that while migrants leave all year round, the highest percentage of migration is around the month of March (Spring) and September (Fall). In comparison, migration is very low in winter between November and February. This pattern of migration is similar for other years in the data.

While the information on migration status, in any year, is the primary outcome of interest, we also examine the dynamic nature of temporary migration decisions. In Table 2 we summarize the four types of year-to-year migration status changes for households. First, if a household was a non-migrant (migrant status = 0) in the previous year and continues to be a non-migrant in the current year, it is indicated as (0 to 0) in Column 1. Thus in 2011, 2012, and 2013, roughly 76%, 74%, and 70%, respectively, of the households did not have a migrant and also did not have one in 2010, 2011, and 2012, respectively. Second, if a household was a non-migrant in the previous year but decides to send a migrant (migrant status = 1) member in current year it is indicated by (0 to 1) in Column 2. In 2011, roughly 9% of the households had a migrant member in 2011 but did not have one in 2010. The third change is (1 to 0), that is, the household recalls a migrant. In 2011, roughly 6% of the households recalled the migrant. In other words, there were 15% of households that had a migrant in 2010, of which 6% recalled

**Figure 1** Migration by month: year 2010.

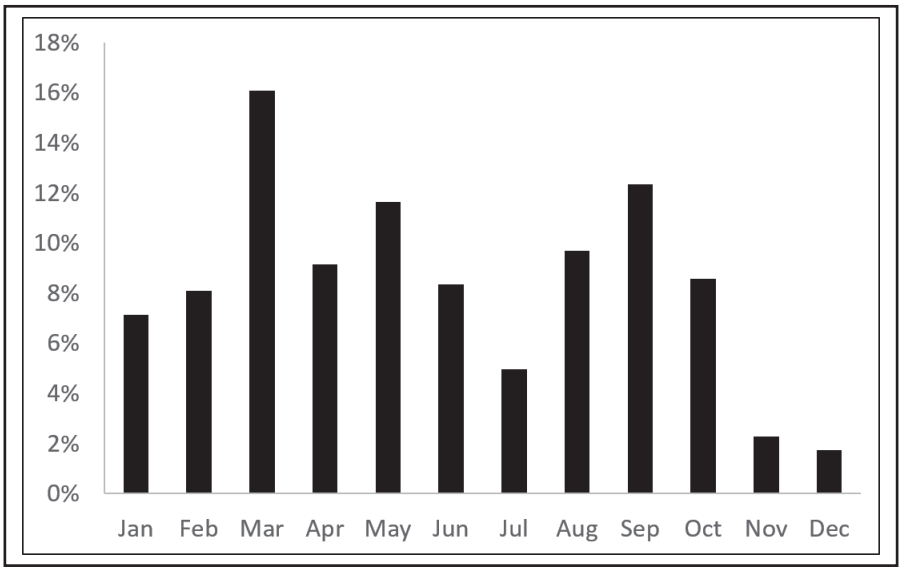



**Table 2** Patterns of migration

| Year | (1) 0 to 0 | (2) 0 to 1 | (3) 1 to 0 | (4) 1 to 1 |
|---|---|---|---|---|
| 2011 | 0.761 | 0.088 | 0.058 | 0.093 |
| 2012 | 0.736 | 0.083 | 0.071 | 0.110 |
| 2013 | 0.699 | 0.107 | 0.090 | 0.105 |

*Notes*: 1 indicates migrant household; 0 indicates non-migrant household. The columns provide fraction of households that are in the four types of switches. (0 to 1) indicates households that switch from being a non-migrant in the previous year to being migrant in the current year; other switches indicated accordingly.

a migrant in 2011; or, conditional of having a migrant, about 40% of households recalled the migrant between 2010 and 2011. Finally, if a household had a migrant in the previous year and continues to have a migrant in the current year it is indicated as (1 to 1) in Column 4. Between 2010 and 2011, roughly 9% of the households continued to have a migrant member.

The pattern of migration indicates that there are households of all types in the data and there are substantial changes in the migration status of households over the period of our analysis. We also find that almost all of the international migration from Kyrgyzstan is temporary in nature: there are only 3% of households that have a migrant status of 1 in all 4 years of the data.

Following the literature on the socio-economic determinants of migration, in our analysis, we control for household demographics, education, and wealth. The demographic control variables we include are: total number of members in a household (*Household size*); gender composition of the household using the ratio of the number of male members in the household and the household size (*Male fraction*); age composition of the household using two variables: the fraction of members in the household older than 18 years of age (*Adult fraction*) and the fraction of household members older than 65 years of age (*Elderly fraction*). To account for education as a determinant of migration, we construct a measure of education at the household level. We use the highest years of schooling achieved by any member within the household (*Education years*). For wealth of a household, we follow Chakraborty et al. (2015) and combine various asset indicators to create a wealth index using a principal component method that serves as a proxy for household income.[7] We then use the wealth index to construct and classify each household into wealth quintiles (*Wealth1–Wealth5*).

Table 3 provides a summary of the data for migrant and non-migrant households for the year 2010.[8] Relative to non-migrant households, migrant households are larger in size, have more male and adult members but few elderly members, and are more educated. In addition, migrant households are relatively poor – they are more likely to belong to the lower wealth quintiles (*Wealth1–Wealth3*) than higher ones.

## 2.1 **Shocks**

Our main explanatory variable of interest is the household exposure to shocks in a specific year. The survey asks each member of the household whether he/she experienced any of the listed shocks during the year preceding the day of the survey.[9] We create a binary variable for each shock that takes a value of 1 if any member of the household indicates that they received the shock, and 0 otherwise. While the survey lists a number of shocks, for our analysis we use all the shocks in the list that are caused by nature – drought, excessive rain or flood and landslide, severe winter and frost, earthquake, and pests.[10] The other questions on shocks that are included in the survey are specific to a region or a household, such as riots, deaths, and illnesses,

7 Specifically, we use a weighted average of whether the household owns a house, car, refrigerator, gas-stove, microwave, washing machine, vacuum cleaner, television, computer, mobile-phone, and livestock.

8 We only present summary statistics for 2010 as household migration status changes across years. Summary statistics for migrant and non-migrant households for other years are similar to that for 2010.

9 While it would be better to use objective measures for the shocks, the LiK data do not provide enough information for us to be able to construct such measures. Specifically, the community links in LiK data are anonymized and hence we cannot connect them to the community geocodes.

10 Given the high correlation between excessive rain and landslide and severe winter and frost, we combine these natural shocks into one shock. Of the households that reported landslide, 64% reported excessive rain; and of the households that reported frost, 75% reported severe winter.

**Table 3** Summary statistics (year 2010)

| Variable | Non-migrant | Migrant |
|---|---|---|
| Household size | 5.07 | 6.45 |
| Male fraction | 0.50 | 0.53 |
| Adult fraction | 0.65 | 0.72 |
| Elderly fraction | 0.07 | 0.03 |
| Education years | 13.35 | 14.50 |
| Wealth 1 | 0.29 | 0.26 |
| Wealth 2 | 0.24 | 0.31 |
| Wealth 3 | 0.20 | 0.25 |
| Wealth 4 | 0.16 | 0.12 |
| Wealth 5 | 0.11 | 0.06 |

*Notes*: Adult fraction is the fraction of household members in the 18–65 years age group; elderly fraction is the fraction of household members older than 65 years. In all regressions, fraction of children, those below 17 years of age, is the excluded category. Wealth1–Wealth5 refers to quintiles of a wealth index created using principle component analysis from a range of asset indicators for a household.

**Table 4** Summary of shocks (2010–2013)

| Variable | Mean | SD | Min | Max |
|---|---|---|---|---|
| Drought | 0.232 | 0.422 | 0 | 1 |
| Rain and landslide | 0.211 | 0.408 | 0 | 1 |
| Winter and frost | 0.379 | 0.485 | 0 | 1 |
| Earthquake | 0.162 | 0.368 | 0 | 1 |
| Pest | 0.193 | 0.394 | 0 | 1 |

**Table 5** Correlation between shocks (year 2010)

| | Drought | Rain and landslide | Winter and frost | Earthquake | Pest |
|---|---|---|---|---|---|
| Drought | 1.00 | | | | |
| Rain and landslide | 0.00 | 1.00 | | | |
| Winter and frost | 0.14 | 0.23 | 1.00 | | |
| Earthquake | 0.02 | 0.26 | 0.17 | 1.00 | |
| Pest | 0.11 | 0.24 | 0.25 | 0.24 | 1.00 |

among others. Unlike weather shocks that are more likely to be exogeneous, the non-weather shocks are likely to be endogenous to a household's characteristics and decisions. Hence, we restrict our analysis to the effect of natural shocks on a household's decision to migrate.

Table 4 provides a summary of the shocks. Given the geography of Kyrgyzstan, all the five shocks are reported with high frequency.[11] Severe winter and frost is the most commonly reported shock while earthquake is the least reported. Table 5 provides the correlation between pairs of shocks for the year 2010. While the correlation coefficient between some pair of shocks

11 Kyrgyzstan is a landlocked Central Asian country with the Tien Shan mountain range and its valleys and basins comprising most of the country (https://www.cia.gov/the-world-factbook/countries/kyrgyzstan/).

is as high as 0.26 (rain and landslide, and earthquake), as we discuss below, we do not find this to be an issue with the identification of the effects of shocks on the migration decision.[12]

## 3 Empirical Specification

We examine the relation between shocks and the decision to migrate by estimating variations of the following baseline empirical model:

$$hhmig_{i,t} = \beta_0 \sum_{j=1}^{5} \gamma_j shock_{i,j,t-1} + X_{i,t}\beta + \phi_t + \phi_t{}^{*}region + \eta_i + \epsilon_{i,t}, \quad (1)$$

where the dependent variable *hhmig* represents migration status for household *i* in year *t*. It takes a value 1 for a migrant household; and a value 0 for a non-migrant household. We include each shock *j* separately as well as all five shocks together in the regression equations that we estimate. The control variables, *X*, included in the regression are household size, fraction of males, fraction of adults, fraction of elderly, years of education, and wealth quintile of households.

As illustrated in Figure 1, while migrants leave all year round, the highest percentage of migration is around the month of March (Spring) and September (Fall), and the survey rounds have typically been fielded between October and December. Thus, when a household is surveyed in 2013, specifically between October 2013 and January 2014, the migrant would have most likely left the household during March–June 2013. This suggests that within a year shocks and migration could occur at the same time. To ensure that for a household the shock precedes the migration decision, we use one-period lagged values ($t-1$) of shocks as explanatory variables. Even though households might want to migrate in the months immediately after the shock, it is likely that there will be some lag in international migration as it takes time to make arrangements to find a job and travel.

Another significant identification challenge arises from the possibility of unobserved heterogeneity. We cannot be sure that the observed correlates of the migration decision are not picking up the effects of other unobserved household characteristics. The longitudinal nature of our data enables us to address this issue by introducing household FE ($\eta_i$), which allows us to control for any time-invariant differences between households. In addition, we include time FE ($\phi_t$) and the interaction of time and region FE ($\phi_t{}^{*}region$) to control for time-varying unobserved heterogeneity at a regional level. We use the oblast of residence for the household as the region. There are nine oblasts in our data.[13]

Including household FE in non-linear models, like probit or logit, can lead to severely biased estimates because of an incidental parameter problem, particularly given that we have limited time variation for each household (Greene et al., 2002; Greene, 2004). Hence, the regressions are estimated using a linear probability model. In addition, to address spatial correlation, we cluster the standard errors (SE) for all regressions at the community-year level since migration outcomes of households are likely to be correlated across households from the same geographic region in a specific year.[14]

12 We find similar correlations between pairs of shocks for other years in the data.

13 While we also have community identification in the data, weather shocks are unlikely to vary across households within these small geographic areas with very few households.

14 We did not cluster at the oblast level since there are very few oblasts and the estimated standard errors are known to be biased with few clusters (Colin and Miller, 2015).

## 4 Effect of Shocks on Migration

We begin by estimating a baseline specification in which we estimate the independent effect of each shock on the decision to migrate, that is, we estimate regression Eq. (1) separately for each shock without including any control variables. As discussed in Section 2, we consider the effect of natural shocks that are available in the data and restrict our attention to households residing in villages.[15]

Table 6 presents the estimates for this baseline specification. In Columns 1–5 an indicator for whether a household experienced each of the shocks in the previous year is introduced separately. Column 1 indicates that a drought in the previous year increases migration for households residing in villages. On the other hand, negative coefficients in Columns 3 indicate that a household is less likely to have a migrant in the current year, if it experienced a severe winter in the previous year. Excessive rain or floods (in Column 2), earthquake (in Column 4), and pest infestation (Column 5) do not have a statistically significant effect on migration. In Column 6, we include all the shocks simultaneously and find that the estimated coefficients are

**Table 6** Migration and shocks

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | b/se | b/se | b/se | b/se | b/se | b/se |
| Drought$_{t-1}$ | 0.038* | | | | | 0.040* |
| | (0.022) | | | | | (0.023) |
| Rain and landslide$_{t-1}$ | | −0.002 | | | | 0.009 |
| | | (0.021) | | | | (0.022) |
| Winter and frost$_{t-1}$ | | | −0.041** | | | −0.045** |
| | | | (0.020) | | | (0.020) |
| Earthquake$_{t-1}$ | | | | −0.009 | | −0.012 |
| | | | | (0.028) | | (0.027) |
| Pest$_{t-1}$ | | | | | 0.015 | 0.012 |
| | | | | | (0.017) | (0.019) |
| Constant | 0.164*** | 0.164*** | 0.194*** | 0.136*** | 0.160*** | 0.168*** |
| | (0.023) | (0.026) | (0.030) | (0.024) | (0.025) | (0.027) |
| Observations | 5,209 | 5,209 | 5,209 | 5,209 | 5,209 | 5,209 |
| Households | 1,781 | 1,781 | 1,781 | 1,781 | 1,781 | 1,781 |
| Household FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year × oblast | Yes | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes*: Migration decision is measured in period *t* and shocks are measured at time *t*–1. All regressions include household, year, and year × oblast FE. SE, clustered by community-year, are reported in parenthesis below the estimated coefficients.

***, **, and * represent significance at the levels of 0.01, 0.05, and 0.10, respectively.

FE, fixed effects; SE, standard errors.

15 We estimated the effects of shocks on migration for households residing in cities. The estimated coefficients for the shocks were not statistically significant, suggesting that these shocks had no effect on the decision to migrate for households residing in cities (Table A1 in Appendix).

similar to those in Columns 1–5. This indicates that the occurrence of each of these shocks is independent of those of the others.

The estimates presented in Table 7 control for household characteristics that are established determinants of migration. We find that larger households and households that have a higher fraction of individuals in the employable age groups, 18–65 years, are more likely to have migrant members. The signs of the estimated coefficients for the control variables are similar to those reported in previous studies [see, e.g., Kaestner and Malamud (2014)].

The estimated coefficients for the shocks remain unaffected by the inclusion of controls, both when shocks enter the specification individually and when shocks are introduced in the regression simultaneously. This suggests that the shocks are very likely exogenous with respect to household characteristics. Nevertheless, we estimate the full specification that includes all the household level control variables for all the analysis that follows.

## 4.1 **Decision to recall and send a migrant**

The estimates reported in Tables 6 and 7 are based on switches in migration status for a household over time. Effectively, we observe whether a household switches from non-migrant to migrant status, or from migrant to non-migrant status, compared to no change in status – a migrant family continues to be a migrant family or a non-migrant family continues to be a non-migrant family.

We go a step further and compare two households that have the same migration status at time $t$ but one switches its status in the next period. The change in migration status of a household can be due to two distinct decisions made by a household in response to shocks: send a member abroad or recall a migrant member. When we observe that a household is likely to be a non-migrant than a migrant, we could infer two possible household decisions – (a) a non-migrant household is less likely to send a migrant or (b) a migrant household is more likely to recall a migrant. When we observe that a household is more likely to be a migrant than a non-migrant, we could infer two possible household decisions – (a) a non-migrant household is more likely to send a migrant or (b) a migrant household is less likely to recall a migrant.

The longitudinal nature of our data, and the prevalence of temporary migration in Kyrgyzstan, allow us to compare the shock-response across households with the same migration status in a base period. Specifically, we separately examine the decision of a household to recall a migrant member, that is, switch from being a migrant household to a non-migrant household, or to send a member abroad, that is, switch from being a non-migrant household to a migrant household. For the former, we restrict our sample to households that had a migrant in the previous period and either continue to have migrants in the current year or switch to being a non-migrant household. In other words, we compare two households that are both migrants in period t – 1 and test whether a shock experienced in period t – 1 leads them to decide to be a non-migrant household in period t. We estimate regression (1) using a sub-sample that contains migrant households in t – 1, with the dependent variable taking a value of 1 if the household recalls the migrant member in period t and 0 when the household does not recall the migrant in period t. For the switch from a non-migrant to migrant household, we compare two households that are both non-migrants in period t – 1 and test whether a shock in period t – 1 leads them to have a migrant in period t. Using a sub-sample that contains non-migrant

**Table 7** Migration and shocks with controls

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | b/se | b/se | b/se | b/se | b/se | |
| $Drought_{t-1}$ | 0.042* | | | | | 0.044* |
| | (0.023) | | | | | (0.024) |
| $Rain\ and\ landslide_{t-1}$ | | −0.002 | | | | 0.008 |
| | | (0.021) | | | | (0.022) |
| $Winter\ and\ frost_{t-1}$ | | | −0.039* | | | −0.042* |
| | | | (0.022) | | | (0.022) |
| $Earthquake_{t-1}$ | | | | −0.006 | | −0.008 |
| | | | | (0.030) | | (0.029) |
| $Pest_{t-1}$ | | | | | 0.014 | 0.010 |
| | | | | | (0.019) | (0.020) |
| Constant | −0.371*** | −0.399*** | −0.337*** | −0.399*** | −0.388*** | −0.365*** |
| | (0.101) | (0.103) | (0.101) | (0.102) | (0.103) | (0.100) |
| Household size | 0.045*** | 0.045*** | 0.045*** | 0.045*** | 0.045*** | 0.045*** |
| | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) |
| Male fraction | 0.085 | 0.084 | 0.088 | 0.083 | 0.082 | 0.087 |
| | (0.082) | (0.083) | (0.083) | (0.083) | (0.083) | (0.082) |
| Adult fraction | 0.448*** | 0.448*** | 0.440*** | 0.448*** | 0.447*** | 0.439*** |
| | (0.080) | (0.080) | (0.079) | (0.080) | (0.080) | (0.079) |
| Elderly fraction | −0.146 | −0.148 | −0.139 | −0.148 | −0.147 | −0.136 |
| | (0.105) | (0.105) | (0.105) | (0.105) | (0.105) | (0.105) |
| Education years | −0.001 | −0.001 | −0.001 | −0.001 | −0.001 | −0.001 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| Wealth2 | −0.037** | −0.036** | −0.035** | −0.035** | −0.035** | −0.035** |
| | (0.017) | (0.018) | (0.018) | (0.017) | (0.018) | (0.017) |
| Wealth3 | −0.021 | −0.020 | −0.019 | −0.020 | −0.019 | −0.019 |
| | (0.023) | (0.023) | (0.023) | (0.023) | (0.023) | (0.023) |
| Wealth4 | −0.029 | −0.027 | −0.024 | −0.027 | −0.027 | −0.025 |
| | (0.028) | (0.028) | (0.028) | (0.028) | (0.028) | (0.027) |
| Wealth5 | −0.003 | −0.001 | 0.001 | −0.001 | 0.000 | −0.001 |
| | (0.037) | (0.037) | (0.036) | (0.037) | (0.037) | (0.036) |
| Observations | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 |
| Households | 1,781 | 1,781 | 1,781 | 1,781 | 1,781 | 1,781 |
| Household FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year × oblast | Yes | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes*: Migration decision is measured in period $t$ and shocks are measured at time $t-1$. All regressions include household, year, and year × oblast FE. SE, clustered by community-year, are reported in parenthesis below the estimated coefficients.

***, **, and * represent significance at the levels of 0.01, 0.05, and 0.10, respectively.

FE, fixed effects; SE, standard errors.

**Table 8** Shocks and decision to recall and send migrants

| | **Recall** | **Send** |
|---|---|---|
| | **b/se** | **b/se** |
| $\text{Drought}_{t-1}$ | −0.066 | 0.053** |
| | (0.072) | (0.021) |
| $\text{Rain and landslide}_{t-1}$ | −0.101 | 0.025 |
| | (0.064) | (0.019) |
| $\text{Winter and frost}_{t-1}$ | 0.146 | −0.004 |
| | (0.103) | (0.017) |
| $\text{Earthquake}_{t-1}$ | 0.016 | −0.008 |
| | (0.087) | (0.022) |
| $\text{Pest}_{t-1}$ | −0.023 | −0.006 |
| | (0.083) | (0.019) |
| Constant | 1.318*** | −0.164* |
| | (0.389) | (0.085) |
| Observations | 891 | 4,160 |
| Households | 523 | 1,668 |
| Household FE | Yes | Yes |
| Year × oblast | Yes | Yes |
| Clustered SE | Yes | Yes |

*Notes*: Migration decision is measured in period *t* and shocks are measured at time $t-1$. All regressions include household, year, and year × oblast FE and all household control variables included in Table 7. SE, clustered by community-year, are reported in parenthesis below the estimated coefficients.

***, **, and * represent significance at the levels of 0.01, 0.05, and 0.10, respectively.

FE, fixed effects; SE, standard errors.

households in t – 1, we estimate regression (1) with the dependent variable taking a value of 1 if the household switches to being a migrant household in period t.

The findings for the analysis of a household's decisions to recall or to send a migrant member are reported in Table 8. The results suggest that while a drought shock increases the probability of sending a member abroad, the effect of a drought shock on recalling a migrant member is negative. In contrast, the estimate for the winter shock for recalling the migrant is positive. While the coefficients for recalling a migrant are large in magnitude, they are not statistically significant. This could be because of the much smaller sample size for households that are all migrants in period $t-1$. However, the estimated magnitude of the coefficient suggests that the likelihood of recalling an existing migrant member increases when there is a winter shock and decreases when there is a drought shock. These findings are aligned with our findings in Table 7 and provide further evidence of the differences in the effects of shocks on the decision to migrate.

## 5 Underlying Mechanisms: Migrant Income and Adult Labor

Our findings indicate that there are significant differences in the effect of shocks on a household's migration decision. While a drought shock increases the probability of a household to

have a migrant, a winter shock reduces the probability of a household to have a migrant. In this section, we discuss potential mechanisms that might underlie these differences.

Depending on the nature of income generating activities that households are engaged in, local labor markets, and liquidity constraints faced by the household, a natural shock might reduce or increase migration. For instance, Gröger and Zylberberg (2016) show that flooding, caused by typhoons, lead to a drop in household income, which increases migration for non-migrant households in rural Vietnam.[16]

In rural Kyrgyzstan, most households raise livestock or engage in growing crops as their main source of income. For instance, in the LiK data, 80% of the households in the rural region report being engaged in agricultural activity or owning livestock or both. Hence, in rural regions, where the labor markets are predominantly agricultural, a drought shock is likely to reduce income and release labor. Moreover, since these shocks are aggregate in nature, they are likely to reduce household income for both migrant and non-migrant households that are engaged in agricultural activities. Members of the non-migrant households affected by these adverse shocks could choose to temporarily migrate in order to insure themselves against the income reductions, in the absence of alternate job opportunities in the local market. On the other hand, for households with existing migrant members, the loss of household income at home is likely to make the household more dependent on outside income, reducing the possibility of recalling the migrant member. In other words, migration could be used by households as a means to buffer against shocks that reduce income from their primary activities.

One possibility is for individuals to migrate to nearby urban regions. However, the migration destination is likely to depend on a combination of factors like the returns to and availability of unskilled work in the destination market, migration network that determines both access to information regarding the destination labor market as well as the migration process itself, and the monetary cost of migration. In the case of Kyrgyzstan, given the history of migration to Russia and Kazakhstan (Dzhooshbekova et al., 2021; Gerber and Zavisca, 2020), and relatively lower returns to unskilled work domestically, a drought shock is likely to trigger international migration to established destinations.[17] An alternate possibility is for people to join self-employment when faced with adverse income shocks. However, Brück et al. (2018) show that in Kyrgyzstan, migrants who were previously self-employed are less likely to be self-employed upon return. This implies that self-employment is likely to be less remunerative than migration. Thus, shocks like drought might raise migration if they reduce the returns to labor in the local market and if the local labor market lacks alternative job opportunities. In our sample, an overwhelming proportion of households are engaged in agriculture and related activities, which implies that droughts are likely to affect income of these households and the local labor markets are unlikely to provide alternative employment opportunities.

While drought increases migration, we find that cold winters reduce migration. In Kyrgyzstan, a bulk of agricultural work and livestock rearing activities take place in the warm months (Atamanov and Berg, 2012). Hence, winter shocks are unlikely to affect agricultural income. A potential explanation for the reduction in likelihood of migration due to a winter

16 Excessive rainfall is also likely to damage crops and affect agricultural income in a way similar to that of a drought shock. However, the estimate for the shock in Table 7, though positive, is not statistically significant.

17 While this does not rule out some domestic migration, we do not combine the two forms as the cost implications of domestic migration are quite different from those of international migration.

**Table 9** Hours spent on activities per day in colder vis-à-vis other months

| Activity | | Mean | SD | P10 | P90 |
|---|---|---|---|---|---|
| Housing/repair | Non-winter | 1.9 | 1.1 | 1.0 | 3.5 |
| | Winter | 2.8 | 2.0 | 1.0 | 5.5 |
| Eat/sleep/laundry | Non-winter | 5.2 | 3.4 | 1.5 | 9.5 |
| | Winter | 5.2 | 3.4 | 1.5 | 9.5 |

*Notes*: Estimates using Time-Use section of the LiK survey conducted between November 1, 2013 and January 30, 2014. Winter refers to period between mid-December and January. Non-winter refers to period between November and mid-December. P10 and P90 refer to the 10th and 90th percentiles of the distribution.

shock could be that such shocks require additional labor input at home. An adult member of the household is likely to contribute to the household not only in terms of earnings but also by providing labor services. The extent of benefit from such labor services, and equivalently the opportunity cost of losing them due to migration, is likely to depend on the need for such services at home. Colder winters could increase the need for additional labor at home. For instance, households in rural Kyrgyzstan have to make heating arrangements at home to keep themselves warm in winters since electric heating is rarely available in rural regions. Hence, the migration decision of the adult member will depend on the availability or cost of these services in the local market. If labor markets are imperfect, such services cannot be purchased from the local market, constraining the migration decision of adult members.

Using a time-use data, collected as part of the 2013 LiK survey, we provide an estimate of the approximate time spent on activities that are labor intensive compared to year-round usual activities in Table 9. The survey was conducted across various households over the period November 2013–January 2014. Hence, while it does not allow us to compare winter and summer, it does allow us to estimate the time-use separately for the coldest periods and the relatively milder weeks preceding these. We use mid-December as a transition from mild to cold winter. We find that the number of hours spent by households in repair and maintenance of the house is much higher in the colder months compared to the milder months. Specifically, households spend an extra hour per day on maintenance and repair of the house in colder periods compared to warmer periods. On the other hand, the average time spent on regular activities like eating, resting, and laundry is identical across these months. This evidence provides support for our argument that a household might anticipate greater labor needs when winters are colder, making it less likely for adult members to migrate.

Thus, depending on the nature of the shocks, households could be faced with an adverse income situation that is likely to increase migration or they could experience an adverse labor situation leading to a decrease in migration. The net effect on the migration decision depends on the relative strengths of these two effects.

## 5.1 Access to finance and migration

It is implicit in the discussion above that migration is used by households as a means to buffer against shocks that reduce domestic income. However, there could be alternative coping mechanisms available, like informal transfers or lending. Informal transfers between households is

widely documented to be a common coping strategy in rural regions where formal financial markets are weak, or even absent (Fafchamps and Gubert, 2007). Hence, the increase in migration in response to income shocks is likely to be muted when the household has other options to mitigate the negative income effects. Therefore, we would expect the migration response to adverse income shocks to be less pronounced in the presence of informal transfers or informal borrowing arrangements. In addition, since monetary transfers are unlikely to compensate for the greater need for labor at home, their availability is unlikely to matter for shocks that change labor requirements.

We empirically examine whether the migration decision of households in response to shocks depends on access to informal finance by estimating the following regression equation:

$$\begin{aligned} hhmig_{i,c,t} = {} & \alpha_0 + X_{i,t}\beta + \alpha_1 shock_{i,t-1} + \alpha_2 easyfin_{c,t-1} + \alpha_3 \left(easyfin_{c,t-1} * shock_{i,t-1}\right) \\ & + \phi_t + \phi_t * region + \eta_i + u_{i,t} \end{aligned} \tag{2}$$

where $X$ is a vector of the control variables that we include for our analysis, *shock* is a one of the natural shocks, *easyfin* is a measure of the ease of access to informal finance for all households residing in community *c*, and *easyfin*shock* is the interaction variable between the shock and access to informal finance. In addition, we include controls for household and interaction of time and region FE.

We define the availability of access to borrowing within a community as the fraction of households in a community that report that it is easy to borrow 2000 Soms, which approximately equals US$ 30 in 2017 (*easyfin*).[18] The range of the variable is between 0, no households in a community report having access to informal finance, to as high as 87.5% of households in a community reporting having access to informal finance.

Table 10 reports the findings from estimating Eq. (2) for each shock separately. In line with our findings in Table 7, the drought shock increases the likelihood of migration. However, the negative and significant estimates for the interaction term (*easyfin*shock*) in Column 1 suggest that a household's access to informal finance lowers the likelihood of having a member migrate when the household is faced with a drought shock. In other words, migration response to income shocks, like drought, is muted when the household is more likely to find help within the community. These findings suggest that for income shocks such as drought, having access to informal finance reduces the need for a household to have a migrant to cope with the adverse effects of the shock.

We find a similar effect for the earthquake shock. The findings in Table 7 suggested that earthquake reduces migration, though the estimate was not statistically significant. However, here we find that earthquake itself increases migration but access to informal finance largely offsets the effect of the shock and reduces migration. This results in the overall effect of the earthquake shock on migration to be zero or even negative.

For winter shocks, the findings indicate that the migration response is not affected by the availability of informal finance. In Table 7 we found that migration is likely to go down when a household faces a winter shock. As discussed in Section 5, one possible explanation for this result is that a severe winter increases adult-labor requirement at home, which leads the household to not have a migrant member or to recall an existing migrant member. Unlike shocks that reduce income of households, access to finance is unlikely to play any mitigating role in the face of shocks that increase domestic labor requirement. Overall, these findings provide

18 The LiK survey was undertaken for 120 geographical clusters, which we define as communities.

**Table 10** Migration, informal finance and shocks

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | b/se | b/se | b/se | b/se | b/se |
| Easyfin | 0.126 | 0.082 | 0.012 | 0.117 | 0.019 |
| | (0.121) | (0.126) | (0.144) | (0.116) | (0.134) |
| $\text{Drought}_{t-1}$ | 0.183** | | | | |
| | (0.077) | | | | |
| $\text{Easyfin} \times \text{drought}_{t-1}$ | −0.346** | | | | |
| | (0.165) | | | | |
| $\text{Rain and landslide}_{t-1}$ | | 0.091 | | | |
| | | (0.093) | | | |
| $\text{Easyfin} \times \text{rain and landslide}_{t-1}$ | | −0.215 | | | |
| | | (0.199) | | | |
| $\text{Winter and frost}_{t-1}$ | | | −0.051 | | |
| | | | (0.067) | | |
| $\text{Easyfin} \times \text{winter and frost}_{t-1}$ | | | 0.028 | | |
| | | | (0.143) | | |
| $\text{Earthquake}_{t-1}$ | | | | 0.176** | |
| | | | | (0.087) | |
| $\text{Easyfin} \times \text{earthquake}_{t-1}$ | | | | −0.431** | |
| | | | | (0.192) | |
| $\text{Pest}_{t-1}$ | | | | | −0.009 |
| | | | | | (0.057) |
| $\text{Easyfin} \times \text{pest}_{t-1}$ | | | | | 0.060 |
| | | | | | (0.143) |
| Observations | 5,051 | 5,051 | 5,051 | 5,051 | 5,051 |
| Households | 1,781 | 1,781 | 1,781 | 1,781 | 1,781 |
| Household FE | Yes | Yes | Yes | Yes | Yes |
| Year × oblast | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | Yes | Yes | Yes | Yes | Yes |

*Notes*: Migration decision is measured in period $t$ and shocks are measured at time $t-1$. All regressions include household, year, and year × oblast FE and all household control variables included in Table 7. SE, clustered by community-year, are reported in parenthesis below the estimated coefficients.

***, **, and * represent significance at the levels of 0.01, 0.05, and 0.10, respectively.

FE, fixed effects; SE, standard errors.

evidence in favor of our proposed mechanisms through which shocks affect temporary international migration.

## 6 Conclusion

Using panel data for households residing in rural Kyrgyzstan, we investigate the role of temporary international migration as a risk mitigation strategy. We ask whether the decision to migrate depends on the shock experiences of a household. We use a household FE model to

account for unobserved correlates of a household's shock experiences and its decision to have a member migrate. In line with the previous literature, we find that shocks with adverse income effects increase migration, indicating that households might use temporary migration as a coping strategy. However, in addition, we find that winter shocks reduce migration.

We argue that the effect of a shock on the decision to migrate depends on the shock effect on households' income and need for labor services. While a drought shock is likely to reduce agricultural production and income, a winter shock is less likely to affect agricultural income as agriculture is primarily done during the warmer months in Kyrgyzstan. Instead, a winter shock increases labor requirement in rural Kyrgyzstan. To substantiate our claim that migration is used as a mitigation strategy in the face of negative income shocks, we explore whether the decision to migrate responds to shocks differently in the presence of alternate coping mechanism. We find that a household's migration response to negative income shocks decreases when access to informal finance is easier, that is, when households find it easier to borrow. However, access to informal finance has no impact on a household's migration response to a winter shock. These findings provide evidence in favor of our proposed mechanisms through which shocks affect temporary migration.

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# Appendix

**Table A1** Migration and shocks: village versus city

| | 1 | 2 | | | |
|---|---|---|---|---|---|
| | b/se | b/se | b/se | b/se | b/se |
| $Drought_{t-1}$ | 0.041* | | | | |
| | (0.022) | | | | |
| City × $drought_{t-1}$ | −0.014 | | | | |
| | (0.035) | | | | |
| Rain and landslide | | 0.001 | | | |
| | | (0.022) | | | |
| City × $rain\ and\ landslide_{t-1}$ | | 0.003 | | | |
| | | (0.045) | | | |
| $Winter\ and\ frost_{t-1}$ | | | −0.026 | | |
| | | | (0.020) | | |
| City × $winter\ and\ frost_{t-1}$ | | | 0.028 | | |
| | | | (0.029) | | |
| $Earthquake_{t-1}$ | | | | −0.018 | |
| | | | | (0.028) | |
| City × $earthquake_{t-1}$ | | | | 0.027 | |
| | | | | (0.041) | |
| $Pest_{t-1}$ | | | | | 0.015 |
| | | | | | (0.018) |
| City × $pest_{t-1}$ | | | | | −0.022 |
| | | | | | (0.052) |
| City significance test | | | | | |
| Ho: shock + city × shock=0 | Accept | Accept | Accept | Accept | Accept |
| Observations | 8,347 | 8,347 | 8,347 | 8,347 | 8,347 |
| Households | 2,976 | 2,976 | 2,976 | 2,976 | 2,976 |
| Household FE | Yes | Yes | Yes | Yes | Yes |
| Year × oblast | Yes | Yes | Yes | Yes | Yes |
| Clustered SE | Yes | Yes | Yes | Yes | Yes |

*Notes*: Migration decision is measured in period $t$ and shocks are measured at time $t-1$. Information on households residing in villages and cities is provided in the data. All regressions include household, year, and year × oblast FE and all household control variables included in Table 7. SE, clustered by community-year, are reported in parenthesis below the estimated coefficients.

***, **, and * represent significance at the levels of 0.01, 0.05, and 0.10, respectively.

FE, fixed effects; SE, standard errors.