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**THE EFFECT OF EMIGRATION
ON HOUSEHOLD LABOR SUPPLY:
EVIDENCE FROM CENTRAL ASIA
AND SOUTH CAUCASUS**

Saumik Paul

Asian Development Bank Institute

Saumik Paul is a research economist at the Asian Development Bank Institute.

The Asian Development Bank recognizes "China" as the People's Republic of China.

Abstract

Using a novel data set, this study finds that households with migrants experience a 26% drop in the labor force participation rate in four economies (Armenia, Azerbaijan, the Kyrgyz Republic, and Tajikistan) from the Central Asia and South Caucasus region. It is twice as large for households with permanent migrants as for households with seasonal migrants. The results do not alter in the presence of selection on unobservables, model misspecification, and selection bias due to the absence of more productive workers. Direct evidence on the remittances that each household received is not available. The empirical findings do, however, suggest the possibility of an increase in reservation wages.

Keywords: emigration, labor mobility

JEL Classification: F22, J61

Contents

1. INTRODUCTION

This paper presents evidence on how emigration affects household labor supply decision making in four countries from the Central Asia and South Caucasus region: Armenia, Azerbaijan, the Kyrgyz Republic, and Tajikistan.

The new economics of labor migration (NELM) theory (Stark 1991; Taylor, Rozelle, and De Brauw 2003) provides a framework within which to analyze households' coping strategies when household members migrate. The NELM predicts two broad channels through which emigration can affect household labor supply decision making: the lost-labor effect and the remittance effect. A decrease in household labor is likely to affect labor decisions differently from an influx of remittances. However, it continues to represent a major challenge in terms of trying to disentangle these two outcomes empirically (Kim 2007). Despite the fact that the direct remittance effect channel provides a common explanation for this phenomenon through an increase in reservation wages, existing studies account for various interconnected factors that are important in determining household labor supply decisions following a negative labor supply shock due to emigration (Cabegin 2006; Carletto and Mendola 2009; Glinskaya and Lokshin 2009; Gagnon 2011).

For the specific case of remittance-receiving countries from Central Asia and the Caucasus, the perspective is a little different. Most of the emigrants from these countries are temporary rather than permanent, unlike the cases in Latin America or Asia (León-Ledesma and Piracha 2004; Mansoor and Quillin 2006). This slight yet important distinction has two important implications for analyzing the impact of remittances on labor markets in this region. First, the central element of remittances is not consumption but instead the use of those funds in productive activities. In addition, short-term migrants have a greater propensity to utilize the acquired skills when they return home; therefore, according to some authors, such as León-Ledesma and Piracha (2004), for the case of Central and Eastern European countries, migration has a positive effect on employment through skill formation and increased investment attributed to remittances. The same authors provide empirical evidence to support the above claim. They estimate a productivity equation using a set of 11 transition countries during the period from 1990 to 1999 and find a positive effect of migration and remittances on reducing unemployment. They state: "Part of remittances is in turn used to establish businesses at home which, along with the proportion of unemployed who migrate, could positively affect the average product in the source country. The impact of migration on unemployment would thus depend on its direct effect on productivity growth and indirectly through the use of remittances in self-employment activities of return migrants" (León-Ledesma and Piracha 2004).

Like other topics of migration research, the endogeneity issue and data availability are the two major constraints in empirical analysis. Various studies make many suggestions. Bussolo and Medvedev (2008) note that, with cross-sectional data, it is difficult to establish whether remittances cause a lower labor supply. Authors tackle this problem by suggesting the utilization of panel data over time; however, the availability of data for a comprehensive group of developing countries over time represents another difficulty. To address the endogeneity issue, Acosta (2006) suggests the utilization of instrumental variables. Another source of problems arises in correctly estimating the increase in remittance receipts. Yang and Choi (2007) identify three potential challenges. First, the classical measurement error in the (increase in) domestic household incomes could lead to a serious attenuation of coefficients in OLS estimations. Second, a problem of reverse causation could arise when trying

to evaluate the remittance receipts, as domestic income itself can be a function of remittances. Third, there are potentially omitted variables that could affect the change in remittances and the change in income. As Hoddinott (1994) and Acosta (2006) point out, the modeling of migration typically uses as proxies the potential migrant's outcome of joint utility maximization as well as that of the immediate household members related to him/her. The assumption that we often follow, that migrant families are consistently different from non-migrant families in observables, such as income, health, wealth, or education, and non-observables, such as ability, income shocks, and so on, challenges the identification of the effects of remittances using standard approaches. To tackle the above-mentioned selection issues, several papers (Hanson 2005; Acosta 2006; Kim 2007; Bussolo and Medvedev 2008) suggest employing panel data structures and including households' fixed effects. This strategy helps to exploit the variability of remittances within the same household over time. However, once again, the issue of data availability could undermine the solution.

Despite a recent spur in micro-level studies identifying various channels through which emigration affects household labor supply decisions, empirical evidence for the causal impact of emigrants on the labor supply in Central Asia and the Caucasus is limited. In the light of the existing literature, we examine the household labor force responses to emigration in Armenia, Azerbaijan, the Kyrgyz Republic, and Tajikistan.[1] Our findings indicate that households with any type of migrant experience roughly a 26% drop in their labor force participation rate. The results do not change when we use a propensity score-matching technique to control for selection bias into migration based on observables. Another test confirms that the selection on unobservables has to be six times stronger on average than the selection on observables to explain the main findings. In addition, the outcomes of doubly robust estimation suggest that there is no bias in the outcome due to model misspecification.

We structure the paper as follows. In section 2, we provide a brief literature survey of the effect of emigration and remittances on the labor supply decision of households with migrants. Section 3 describes the data and provides some descriptive evidence. We discuss the empirical models, identification strategies, and empirical findings in section 4. The paper ends with concluding remarks on the main themes of this topic.

2. A BRIEF LITERATURE SURVEY

The theoretical approach to analyzing the impact of remittances on labor markets derives from the neoclassical models of labor–leisure choice, which Barzel and McDonald (1973) and Killingsworth (1983) developed. These consider remittances to be non-labor income. In recent years, the interest in using general equilibrium models to analyze the specific transmission channels through which remittances affect participation in labor markets has grown (Kim 2007; Bussolo and Medvedev 2008). Bussolo and Medvedev (2008) develop a basic model in which an increase in remittances is equivalent to a permanent increase in the income of the household. They further argue that this increase has an effect on the behavior of tradable and non-tradable goods in the economy: the increase in the household's income represents extra spending on tradable and non-tradable goods (assuming that non-tradable goods are normal goods). The final link in this basic model assessing the impact of remittances comes from the modification of the above model based on the work of Barzel and McDonald (1973) and Annabi (2004) and most prominently Killingsworth

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[1] A recent study by Brownbridge and Canagarajah (2010) shows a significant contribution of remittances in the Kyrgyz and Tajik economies.

(1983), which introduces a consumption–leisure trade-off into the household utility function.

The theoretical models conclude that the labor supply decreases with non-labor income, and the sign of the elasticity will depend on the ratio of non-labor income to total consumption expenditure. Bussolo and Medvedev (2008) further explain that, with an increase in non-labor income through remittances, individuals can consume more goods and leisure (i.e. the income effect dominates) and thus their labor supply is reduced. In a general equilibrium setting, wages are set to clear the labor market and a reduced labor supply implies rising wages. According to them, this triggers second-order effects. They show that higher wages increase the opportunity cost of leisure and the substitution effect can push individuals to increase their labor supply to the point at which the income effect dominates again, similar to a backward-bending labor supply curve.

The typical channels of transmission that authors cite is the effect that remittances have on enterprise development, which in turn could apply to increases in the labor supply in the remittance-receiving country. Scholars such as Amuedo-Dorantes and Pozo (2005) find that remittances can help families to overcome budget constraints, elevate reservation wages, and, through an income effect, reduce the employment likelihood and hours of work of remittance-receiving households' members. However, the additional flow of money attributed to remittances can induce other remaining family members to increase their labor supply to supplement the lost household income. Amuedo-Dorantes and Pozo (2005) and Justino and Shemyakina (2012) expand this approach by exploring the initial investment required by certain members of the household to migrate effectively. They maintain that the initial investment may force the household members who stayed behind to increase their workload or enter the workforce.

Justino and Shemyakina (2012) explore the remittance and labor supply relationship in the context of conflict-affected areas. Since conflict increases the likelihood of death, injury, or asset loss for household members in the remittance-receiving country, the authors find that remittances cannot potentially yield any effect on the labor supply of household members if the level of remittances received substitutes the loss of household adult workers. Moreover, as Voors et al. (2010) argue, conflict may affect risk perceptions and shorten the planning horizon of household members, therefore modifying the utilization (and impact) of remittances. There are also some theoretical advances regarding the question of whether remittances condition the way in which migration affects labor market outcomes. According to Hanson (2005), in the absence of remittances, emigration is likely to increase adults' labor force participation, partly due to the upward pressure that emigration exerts on wages. Furthermore, there is a need to replace income lost to the exodus of wage earners from households. With remittances, however, migrant families may feel less need to have non-migrating adults work outside the home. Particularly for women, remittances may decrease the incentives to spend time in the labor force and increase the incentives to invest in home production, as Hanson postulates.

Funkhouser (1992) conducts an early study on this topic in Nicaragua. This study documents that remittances increase self-employment and reduce the labor supply for women. It argues that it is possible to attribute the effect of self-employment to the channeling of remittances to entrepreneurial activities. Woodruff and Zenteno (2001) find that small enterprises in Mexico have a higher level of investment in states with higher migration rates and higher remittance receipts; they state that capital and financial constraints in enterprise development are overcome by the reception of remittances.

Gender disparity in the labor force participation rate because of emigration occurs mainly because men and women play different roles in the household. When men emigrate, women are left with more housework as well as the extra burden of working to meet short-term needs (Taylor 1999). Several papers point to the emigration of husbands as a catalyst for the emancipation of women in the labor market and in household decision making (Cabegin 2006; Carletto and Mendola 2009; Glinskaya and Lokshin 2009). However, a number of studies show a decline in labor market activities, especially for women in households in which family members are working abroad (Rodriguez and Tiongson 2001; Acosta 2006; Amuedo-Dorantes and Pozo 2006; Lokshin and Glinskaya 2009; Mendola and Carletto 2009). One reason for this could be the outflow of more productive workers (household heads, for example), especially in rural areas, which often leads to a smaller active labor force consisting of the remaining less capable workers (Damon 2009). In addition, Taylor (1984) notes that, because of strong social norms, the need for additional labor in villages with high migration rates typically prevents women from joining the paid labor force.

The inflow of remittances can create more opportunities through entrepreneurial initiatives and the promotion of new jobs (Yang 2008). Sometimes it creates positive spillover effects for non-migrant households as well. Based on a disaggregated rural economy-wide analytical exercise, migration and remittances spurred labor opportunities and higher wages for members of rural Mexican households with members who did not migrate (Dyer and Taylor 2009). In another paper, Yang (2005) asserts that the favorable exchange rate shocks caused by remittances lead to an expansion of capital-intensive enterprises in migrants' origin households. Acosta (2006), using selection correction techniques, such as propensity score matching, and village and household networks as instruments for remittance receipts for El Salvador, finds evidence suggesting that remittances are negatively related to the child labor and adult female labor supply. The author also finds that girls and young boys (under 15 years old) from recipient households are more likely to be enrolled in school than those from non-recipient households. Other papers also find extensive evidence that suggests that remittances have a negative impact on labor. Rodriguez and Tiongson (2001), analyzing data for 1991 in the city of Manila, the Philippines, find evidence that having a migrant member in a household reduces the probability of working for the household's other family members. Additionally, after controlling for remittances, the authors conclude that men and women also reduce their labor force participation. Similarly, Matshe and Young (2004), in their analysis of the responses of rural households in Zimbabwe, find that flows of non-labor income (which include remittances) reduce off-farm labor productivity.

Amuedo-Dorantes and Pozo (2005), for the case of Mexico, find that remittances sometimes reduce the number of hours worked, whereas at other times these additional monetary inflows attributed to remittances increase the work effort. The results depend on the type of work being carried out, the gender of the recipient, and the location of the household. Kim (2007), using a pseudo data panel constructed from Jamaican household surveys from 1995 to 2002, discovers that remittances had a negative impact on labor market participation. Building on similar research, Bussolo and Medvedev (2008), in their examination of Jamaica, using a 2002 social accounting matrix for the country, find that remittances reduce labor force participation by increasing the reservation wages of recipients.

Studies also investigate the impact of remittances on the labor supply in a post-conflict scenario. Justino and Shemyakina (2012) analyze the impact of remittances on the labor supply of men and women in post-conflict Tajikistan and find that on average men and women from remittance-receiving households are less likely to participate in the

labor market and supply fewer hours of labor when they do participate. In addition, from a gender perspective, it turns out that the negative effect of remittances on the labor supply is smaller for women. This outcome is interesting, since other studies on remittances and the labor supply (the ones exposed in the first part of this section) show that the female labor supply is more responsive to remittances.

Finally, a recent cross-country analysis using aggregate-level data demonstrates a positive and significant relationship between remittances and the aggregate labor supply (Posso 2011). The author uses panel data for 66 developing countries from the Middle East and Africa, Asia and the Pacific, and Latin America and the Caribbean for 1985 to 2005. Posso argues that three potential channels support his findings. First, non-migrant household members increase their labor supply to defray migration-related expenses. Second, neighboring households increase their labor supply so that they can send their members abroad to take advantage of the benefit of remittances. Third, remittances generate employment when money flows into households.

3. DATA AND SUMMARY STATISTICS

The data used for this analysis are part of the household survey on remittances and poverty that the Asian Development Bank (ADB) conducted in 2007 under the project titled "A Study on International Migrants' Remittances in Central Asia and South Caucasus." It implemented household surveys in four countries—Armenia (3,000 households), Azerbaijan (3,900 households), the Kyrgyz Republic (4,000 households), and Tajikistan (3,300 households)—and divided the total sample into three strata—the capital, urban areas, and rural areas—proportional to their share in the total number of households in each country. Thus, the study contained three representative samples formed at the country, rural, and urban levels, respectively.

We define as migrants individuals who were members of the household before going abroad and would have been a member of the household in 2006 if they had stayed in the country. The questionnaire asks whether the migrant is a seasonal migrant. We use the response to this question to distinguish between seasonal and permanent migrants in our analysis. As Table 3.1 shows, 8.2% of the members of the population in Tajikistan are migrants, followed by Armenia (6.1%), the Kyrgyz Republic (4.8%), and Azerbaijan (3.6%). However, permanent migrants are more numerous than seasonal migrants in all the countries except Tajikistan.

Table 3.1: Seasonal and Permanent Migrants by Country and Sub-region (Strata)

		Armenia	**Azerbaijan**	**Kyrgyz Republic**	**Tajikistan**
Capital city	Seasonal	0.7%	0.4%	0.2%	1.3%
	Permanent	4.7%	2.5%	3.1%	2.3%
Other urban	Seasonal	3.5%	0.9%	1.4%	6.3%
	Permanent	3.7%	2.7%	4.3%	1.4%
Rural	Seasonal	2.9%	1.1%	1.1%	6.3%
	Permanent	2.9%	2.9%	3.6%	2.7%
Total		**6.1%**	**3.6%**	**4.8%**	**8.2%**

Source: Authors' calculation based on the ADB database.

Almost 33% of the households in Tajikistan had seasonal migrants, followed by 10% in Armenia, 5% in the Kyrgyz Republic, and almost 4% in Azerbaijan (Table 3.2). The picture is a little different when we compare permanent migrants. The percentage of households having permanent migrants is between 12% and 14% for all the countries except Azerbaijan (about 10%).

Table 3.2: Share of Households with Migrants

	Armenia	Azerbaijan	Kyrgyz Republic	Tajikistan
Seasonal	10.2%	3.8%	4.9%	32.5%
Permanent	12.2%	9.8%	14.6%	13.3%

Source: Authors' calculation based on the ADB database.

3.1 Are Migrant-Sending Households Different from Others?

From Table 3.3 it appears that migrant-sending households and other households differ in terms of a few demographic, socio-economic, and geographic characteristics for all the countries in our sample. In Azerbaijan, the Kyrgyz Republic, and Tajikistan, rural areas constitute more than 60% of the total population, and almost three-quarters of the total migrants are from rural areas. In Armenia, the migrant-sending households are more evenly distributed between urban and rural areas. Most of the household head's characteristics are similar between households with and households without migrants. A few exceptions include the higher education of household heads in the Kyrgyz Republic and Tajikistan. It turns out that members of households with higher-educated heads are less likely to migrate. This could be a factor contributing to selection into migration for low-skilled laborers.

Table 3.3: Comparison of Observable Characteristics between Households with Migrants and Households without Migrants

		Armenia		Azerbaijan		Kyrgyz Republic		Tajikistan	
		Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant
Geography	Capital city	36.7%	26.7%	27.5%	21.2%	14.0%	6.2%	15.8%	5.5%
	Other urban	28.0%	34.3%	28.0%	26.0%	17.0%	20.3%	20.9%	18.5%
	Rural	35.3%	39.0%	44.5%	52.8%	69.0%	73.5%	63.3%	76.1%
Household head	Female	24.3%	22.0%	17.8%	17.9%	20.7%	36.9%	16.8%	21.5%
	Age	57.3	56.9	53.3	55.1	50.0	51.2	51.9	54.8
	Primary education	8.7%	8.7%	4.7%	6.7%	2.2%	1.2%	6.1%	10.4%
	Secondary education	31.2%	32.1%	45.3%	49.0%	46.1%	51.8%	37.7%	40.9%
	Higher education	20.4%	19.5%	20.9%	19.9%	18.6%	14.2%	21.1%	12.8%
	Married	71.6%	74.2%	77.7%	77.0%	76.0%	73.9%	79.5%	77.7%
	Never married	1.8%	2.8%	1.2%	1.8%	1.6%	2.8%	1.1%	1.8%
	Divorced	1.8%	1.9%	1.3%	1.9%	4.5%	3.6%	1.4%	0.7%
Other	Asset index	0.9	1.1	0.3	0.6	–0.4	0.0	–0.6	–0.3
	Food expenditure share	56.5%	52.7%	62.3%	62.2%	56.6%	55.6%	57.7%	54.5%

Notes: The authors constructed the asset index from a range of asset holdings using first principal components.

Source: Authors' calculation based on the ADB database.

To examine the potential wealth bias in selection into migration, we construct a wealth index following Filmer and Pritchett (2001), which estimates the wealth effects and economic status of households. We find evidence that migrant-sending households on average have a higher wealth index. However, once compared in terms of the food expenditure share, the difference is negligible.

4. IMPACT OF EMIGRATION ON HOUSEHOLD LABOR MARKET PARTICIPATION

We assume that the decision function to participate in the labor market is unobservable. However, we use a dummy variable for participation in the labor force, which takes the value of one if an individual is actively participating in the labor force and zero otherwise. To begin with, we employ a restricted version of the probit model controlling only for baseline individual and household characteristics.

4.1 Are Households with Migrants Less Likely to Work?

Based on the restricted model, the marginal effect of having a migrant indicates that on average members of a migrant-sending household are 19% less likely to participate actively in the labor force. It shows a participation gap of 12% and 22% for households with seasonal migrants and permanent migrants, respectively (Table 4.1.1). It also suggests that permanent migrants are more likely to reduce the labor market activities of their family members back home, possibly through the remittance channel.

Table 4.1.1: Restricted Model Probit Outcomes on Individual Labor Force Participation

	All Countries		Armenia		Azerbaijan		Kyrgyz Republic		Tajikistan	
HH with migrants	–0.52***	R^2=.13	–0.734***	R^2=.17	–0.604***	R^2=.11	–0.378***	R^2=.17	–0.459***	R^2=.16
	(–.19)		(–.28)		(–.24)		(–.13)		(–.17)	
HH with seasonal migrants	–0.27***	R^2=.11	–0.431***	R^2=.14	–0.324***	R^2=.10	0.408***	R^2=.16	–0.319***	R^2=.15
	(–.10)		(–.17)		(–.13)		(0.11)		(–.12)	
HH with permanent migrants	–0.59***	R^2=.13	–0.910***	R^2=.17	–0.683***	R^2=.11	–0.560***	R^2=.18	–0.413***	R^2=.15
	(–.22)		(–.35)		(–.27)		(–.20)		(–.16)	
Baseline controls	Yes		Yes		Yes		Yes		Yes	
Country fixed effect	Yes		–		–		–		–	
Household controls	No		No		No		No		No	
Individual controls	No		No		No		No		No	
Observations	43,257		8,443		11,601		10,913		12,297	

The figures within brackets on the second row in each cell correspond to marginal effects; R^2 represents pseudo-R^2.

The baseline controls include geography, following firstly the characteristics of the household head (ethnicity, gender, age, and age-squared) and secondly the characteristics of the individual (age, squared age, and gender).

The household controls include the following features of the household head: education categories, years of education, marital status, occupation employment sector, asset index, and share of food expenditure. The individual controls include the following individual-level characteristics: marital status, years of education, and educational category.

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 4.1.2 reports the outcomes for the full probit model including a wide range of individual and household characteristics. The full model's outcomes suggest that emigration has a similar negative impact on labor force participation, yet the estimated coefficients show a greater magnitude.

Table 4.1.2: Full-Model Probit Outcomes for Individual Labor Force Participation

	All Countries		Armenia		Azerbaijan		Kyrgyz Republic		Tajikistan	
HH with migrants	−0.68***	R^2=.26	−1.04***	R^2=.31	−0.86***	R^2=.30	−0.56***	R^2=.39	−0.62***	R^2=.26
	(−.26)		(−.40)		(−.33)		(−.19)		(−.23)	
HH with seasonal migrants	−0.32***	R^2=.23	−0.48***	R^2=.27	−0.30***	R^2=.28	0.54***	R^2=.38	−0.41***	R^2=.25
	(−.12)		(−.19)		(−.12)		(0.13)		(−.16)	
HH with permanent migrants	−0.69***	R^2=.25	−1.09***	R^2=.30	−0.94***	R^2=.30	−0.79***	R^2=.40	−0.45***	R^2=.24
	(−.27)		(−.41)		(−.36)		(−.28)		(−.17)	
Baseline controls	Yes		Yes		Yes		Yes		Yes	
Country fixed effect	Yes		–		–		–		–	
Household controls	Yes		Yes		Yes		Yes		Yes	
Individual controls	Yes		Yes		Yes		Yes		Yes	
Observations	43,253		8,434		11,585		10,913		12,293	

The figures within brackets on the second row in each cell correspond to marginal effects; R^2 represents pseudo-R^2.

The baseline controls include geography, following firstly the characteristics of the household head (ethnicity, gender, age, and age-squared) and secondly the characteristics of the individual (age, squared age, and gender).

The household controls include the following characteristics of the household head: education categories, years of education, marital status, occupation, sector of employment, asset index, and share of food expenditure.

The individual controls include the following individual-level characteristics: marital status, years of education, and educational category.

Note: *** p<0.01, ** p<0.05, * p<0.1.

The likelihood of labor force participation is more than 50% lower for households with permanent migrants than for households with seasonal migrants; this outcome is robust across all the country samples except Tajikistan. This could be because almost 20% of the permanent-migrant households in Tajikistan also have seasonal migrants.

The empirical outcome discussed so far could be biased if the decision to migrate is correlated with unobservables. In addition, the possibility of selection into migration based on observable characteristics may prevent emigration from being an exogenous shock. In either case, probit regression outcomes may fail to produce an unbiased outcome.

4.2 To What Extent Do Unobservables Affect the Outcomes?

We follow the strategy that Altonji, Elder, and Taber (2005) developed using selection on observables to estimate the potential bias from unobservables. Based on this method, we calculate the ratio R= $\frac{\widehat{\beta_{Full}}}{\widehat{\beta_{Restricted}} - \widehat{\beta_{Full}}}$, which indicates how much stronger selection on unobservables, relative to selection on observables, needs to be to explain the estimated effect of the full probit model. Using the estimated coefficients from the probit models that we ran (Table 4.1.1 and Table 4.1.2), the average of the 15 ratios is close to 6 (Table 4.2). Thus, on average the selection of unobservables has to be six times stronger than the selection of observables to explain the estimated

probit results. It is less likely that the selection on unobservables will affect the estimated outcomes.

**Table 4.2: Selection of Observable Factors Determining
the Bias from Unobservable Factors**

	All Countries			Armenia			Azerbaijan			Kyrgyz Republic			Tajikistan		
Full model	−0.68	−0.32	−0.69	−1.03	−0.48	−1.09	−0.86	−0.30	−0.93	−0.56	0.54	−0.80	−0.61	−0.41	−0.45
Restricted model	−0.52	−0.27	−0.59	−0.73	−0.43	−0.91	−0.60	−0.32	−0.68	−0.38	0.41	−0.56	−0.46	−0.32	−0.41
Ratio	−4.24	−7.25	−6.85	−3.44	−9.34	−6.19	−3.34	12.53	−3.72	−3.10	−4.17	−3.36	−3.95	−4.35	−11.5

Note: The full model includes the baseline, household, and individual controls, whereas the restricted model includes only the baseline controls.

4.3 Selection into Migration: Does it Alter the Findings?

To examine the possibility of selection into migration based on observable characteristics, we employ propensity score matching (Rosenbaum and Rubin 1983). This involves pairing individuals who are identical based on all the observable characteristics. In Annex 1, we provide a simple description of propensity score matching with the nearest-neighbor matching strategy. Annex 2 provides a visual description of the comparison of propensity score distributions between the migrant-sending households (treated) and the matched comparison groups (untreated). The visual analysis of the density distribution of propensity scores is the most straightforward way to check the overlap and the region of common support between the treatment and the comparison group (Caliendo and Kopeinig 2005). As shown in Annex 2, most of the models show a satisfactory match just through visual observations.

**Table 4.3: Estimated Effects of Emigration on Labor Force Participation
Using Propensity Score Matching**

		Treated	Controls	Difference	T-stat.
All countries	HH with migrants	0.48	0.61	−0.13	−7.07
	HH with seasonal migrants	0.52	0.58	−0.06	−3.78
	HH with permanent migrants	0.42	0.63	−0.20	−18.56
Armenia	HH with migrants	0.48	0.60	−0.12	−6.27
	HH with seasonal migrants	0.52	0.60	−0.08	−5.54
	HH with permanent migrants	0.42	0.63	−0.21	−18.84
Azerbaijan	HH with migrants	0.48	0.60	−0.12	−6.27
	HH with seasonal migrants	0.52	0.60	−0.08	−5.54
	HH with permanent migrants	0.42	0.63	−0.21	−18.84
Kyrgyz Republic	HH with migrants	0.48	0.60	−0.12	−6.27
	HH with seasonal migrants	0.52	0.60	−0.08	−5.54
	HH with permanent migrants	0.42	0.63	−0.21	−18.84
Tajikistan	HH with migrants	0.48	0.60	−0.12	−6.27
	HH with seasonal migrants	0.52	0.60	−0.08	−5.54
	HH with permanent migrants	0.42	0.63	−0.21	−18.84

Note: We use the nearest-neighbor matching method to construct the comparison households' group.

Table 4.3 summarizes the estimated effect of emigration on labor force participation for each of the 11 models. The propensity score-matching method results in emigration having a negative impact on labor market activities for household members, specifically those migrants who stayed at home. However, the magnitude of the gap in labor force participation is smaller than the full probit model outcomes. The mean difference or the average treatment effect on the treated (ATT) is statistically significant in all the models.

4.4 Doubly Robust Estimation: More Protection against Model Misspecification?

Any method that uses propensity score matching requires that the model is specified correctly and includes all the relevant confounders (Emsley et al. 2008). In reality it is hard to ascertain that the empirical models that we estimate are correctly specified. However, as a robustness check, we can use the concept of doubly robust estimators (Bang and Robins 2005). The doubly robust estimation method requires a model for estimating the propensity scores and the outcome model (probit in our case) in the same estimator. Ideally, this method selects only those observations that receive common support and discards the rest of the data. Additionally, it retains the weights from matching and therefore indicates how many times each control case will appear in the regression. The doubly robust estimators provide unbiased estimates for the treatment effect when either or both of these models are correctly specified. In a sense, it provides more protection against misspecification (Uysal 2011).

In Table 4.4, we compare the estimates of the probit model and the doubly robust model for 15 regression models. If these models are correctly specified, then ideally the doubly robust estimates will produce a similar effect. Most of the models show similar marginal effects between the probit model and the doubly robust model. Overall, the support is mixed but in favor of estimated coefficients with fewer potential problems from model misspecification.

Table 4.4: Comparison of the Estimated Effects of Emigration on the Likelihood of Labor Market Participation: Full Model Probit Outcomes and Doubly Robust Model Outcomes

		HH with Migrants	HH with Seasonal Migrants	HH with Permanent Migrants
All countries	Full-model probit outcome	−0.26***	−0.12***	−0.27***
	Doubly robust outcome	−0.20***	−0.10***	−0.24***
Armenia	Full-model probit outcome	−0.40***	−0.19***	−0.41***
	Doubly robust outcome	−0.34***	−0.19***	−0.34***
Azerbaijan	Full-model probit outcome	−0.33***	−0.12***	−0.36***
	Doubly robust outcome	−0.22***	−0.17***	−0.30***
Kyrgyz Republic	Full-model probit outcome	−0.19***	0.13***	−0.28***
	Doubly robust outcome	−0.18***	0.09***	−0.25***
Tajikistan	Full-model probit outcome	−0.23***	−0.16***	−0.17***
	Doubly robust outcome	−0.21***	−0.14***	−0.20***

Note: The cell entries are marginal effects; *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

4.5 Is There a Gender Gap in Labor Force Participation for Migrant-Sending Households?

There is mixed evidence concerning the gender disparity in the labor force participation rate as a result of emigration. To draw conclusions on this, we run the full probit model on the female sample. Overall, the likelihood of female labor force participation is 7% lower in migrant-sending households than other households. However, except in Armenia, females are more likely to work if they have seasonal migrants in their family. For permanent migrants, the case is quite the opposite. It could be argued that seasonal migrants create extra burdens for their female household members in that they have to meet short-term needs, whereas permanent migrants send remittances that increase their reservation wages to join the labor force.

Table 4.5: Full-Model Probit Outcomes for Individual Labor Force Participation: Female Sample

	All Countries		Armenia		Azerbaijan		Kyrgyz Republic		Tajikistan	
HH with migrants	–0.172***	R^2=.23	–0.541***	R^2=.25	–0.174**	R^2=.21	–0.202***	R^2=.39	–0.034	R^2=.24
	(–.07)		(–.21)		(–.07)		(–.07)		(–.01)	
HH with seasonal migrants	0.130***	R^2=.23	–0.065	R^2=.24	0.145	R^2=.21	0.474***	R^2=.39	0.084	R^2=.24
	(0.05)		(–.03)		(0.06)		(0.12)		(0.03)	
HH with permanent migrants	–0.337***	R^2=.23	–0.747***	R^2=.25	–0.271***	R^2=.21	–0.375***	R^2=.39	–0.129*	R^2=.24
	(–.13)		(–.29)		(–.11)		(–.12)		(–.04)	
Baseline controls	Yes		Yes		Yes		Yes		Yes	
Country fixed effect	Yes		–		–		–		–	
Household controls	Yes		Yes		Yes		Yes		Yes	
Individual controls	Yes		Yes		Yes		Yes		Yes	
Observations	22,359		4,528		5,881		5,531		6,360	

The figures within brackets on the second row in each cell correspond to marginal effects; R^2 represents pseudo-R^2.

The baseline controls include geography, following firstly the characteristics of the household head (ethnicity, gender, age, and age-squared) and secondly the characteristics of the individual (age, squared age, and gender).

The household controls include the following characteristics of the household head: education categories, years of education, marital status, occupation, sector of employment, asset index, and share of food expenditure.

The individual controls include the following individual-level characteristics: marital status, years of education, and educational category.

Note: *** p<0.01, ** p<0.05, * p<0.1.

4.6 Do Household Members Other than Heads Have Less Potential to Join the Labor Market?

Finally, we examine the possibility of a lower labor force participation rate for those who are left behind because they are less able to find a job when more productive workers (household heads, for example) migrate. We run the full probit model on a restricted sample excluding the households in which the head migrates. A negative coefficient with a smaller magnitude than the full probit estimations would indicate that the absence of household heads reduces the labor force participation at a higher rate. Table 4.6 reports the regression outcomes of these restricted sample models. The marginal effects show similar outcomes to the full probit model in most of the cases. However, the labor force participation gap between migrant-sending households and

the rest increases for seasonal migrants in Armenia and Azerbaijan. This implies that, when household heads are at home and other members of the households migrate for seasonal work, the labor force participation rate drops at a higher rate. This refutes the possibility that members other than household heads have less potential to join the labor market.

Table 4.6: Full-Model Probit Outcomes for Individual Labor Force Participation:
Sample Excluding Household Head Migrants

	All Countries		Armenia		Azerbaijan		Kyrgyz Republic		Tajikistan	
HH with migrants	−0.743***	R^2=.25	−1.121***	R^2=.31	−1.03***	R^2=.31	−0.60***	R^2=.39	−0.64***	R^2=.26
	(−.28)		(−.42)		(−.39)		(−.21)		(−.24)	
HH with seasonal migrants	−0.410***	R^2=.23	−0.686***	R^2=.27	−0.63***	R^2=.28	0.60***	R^2=.38	−0.45***	R^2=.24
	(−.16)		(−.27)		(−.25)		(.14)		(−.17)	
HH with permanent migrants	−0.763***	R^2=.25	−1.245***	R^2=.31	−1.10***	R^2=.30	−0.83***	R^2=.40	−0.48***	R^2=.24
	(−.29)		(−.46)		(−.41)		(−.29)		(−.19)	
Baseline controls	Yes		Yes		Yes		Yes		Yes	
Country fixed effect	Yes		–		–		–		–	
Household controls	Yes		Yes		Yes		Yes		Yes	
Individual controls	Yes		Yes		Yes		Yes		Yes	
Observations	41,277		7,954		11,178		10,753		11,364	

The figures within brackets on the second row in each cell correspond to marginal effects; R^2 represents pseudo-R^2.

The baseline controls include geography, following firstly the characteristics of the household head (ethnicity, gender, age, and age-squared) and secondly the characteristics of the individual (age, squared age, and gender).

The household controls include the following characteristics of the household head: education categories, years of education, marital status, occupation, sector of employment, asset index, and share of food expenditure.

The individual controls include the following individual-level characteristics: marital status, years of education, and educational category.

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

5. CONCLUSION

The goal of this paper is to provide empirical evidence on how emigration affects household labor supply decisions in Armenia, Azerbaijan, the Kyrgyz Republic, and Tajikistan. We use household survey data from the project titled "A Study on International Migrants' Remittances in Central Asia and South Caucasus," which the Asian Development Bank (ADB) conducted in 2007, to generate causal inferences on the possible effects of emigration on labor force participation rates.

Our findings indicate that households with any type of migrant experience roughly a 26% drop in their labor force participation rate. The results do not change when we use a propensity score-matching technique to control for selection bias into migration based on observables. Another test confirms that the selection on unobservables has to be six times stronger on average than the selection on observables to explain the main findings. In addition, the outcomes of doubly robust estimation suggest that there is no bias in the outcome due to model misspecification. Female members of seasonal migrants contribute to a higher labor force participation rate, whereas the outcomes for female members of households with permanent migrants are in line with the average findings. Finally, our findings reject the possibility that lower labor force participation is caused by a residual workforce with lower potential in the absence of more productive workers.

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ANNEX 1

Let us denote the binary migrant indicator M_i as equal to one if individual *i* belongs to a family with a migrant and zero otherwise. We are particularly interested in estimating the average treatment effect on the treated (ATT). This can be written as equation (1) below:

$$\tau_{ATT} = LFP(\tau|M = 1) = E\left[LFP(1)|M = 1\right] - E\left[LFP(0)|M = 1\right] \tag{1}$$

where $LFP_i(M_i)$ denotes the potential labor force participant. As the average labor force participation rate of the counterfactual comparison group, $E(LFP(0)|M = 1)$, is not observed, we generate propensity scores to choose a proper substitute from the matched pairs based on propensity scores. We perform simple probit regression to generate the propensity scores. We choose and pair the individuals from the migrant families (treatment group) and the rest (control group) based on similar propensity scores. We then calculate the average difference in the labor force participation rate across them.

A range of possibilities exists for matching algorithms; however, the performance of different matching estimators depends largely on the data structure (Zhao 2000). For our purpose, we use straightforward nearest-neighbor matching as a baseline strategy. This method first categorizes both the treatment and the control group according to the estimated propensity score and then searches backwards and forwards for the closest control units for a particular treatment value. To determine the average treatment effect on the treated (ATT), it is sufficient to ensure the existence of potential matches in the control group (Bryson, Dorsett, and Purdon 2002).

ANNEX 2

Graphical distribution of common support based on observable characteristics between households with migrants (treatment group—in red) and households without migrants (comparison group—in blue)