MIGRATION, REMITTANCES AND INCOME INEQUALITY IN KYRGYZSTAN: EVIDENCE FROM THE LIFE IN KYRGYZSTAN SURVEY

A THESIS

Submitted to

Central European University

Department of Economics and Business

in Partial Fulfillment of the Requirements for the Degree of

Master of Arts in Economics

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Vienna, Austria

November 2022

ABSTRACT

This paper estimates the impact of remittances on the degree of income inequality using the latest wave of the Life in Kyrgyzstan survey for the year 2016. The objective of the paper is to find out how international remittances affect income distribution in such remittances-dependent country as Kyrgyzstan and to assess the magnitude of the effect. The identification strategy relies on the probit model with the application of propensity score matching technique to estimate the causal impact. Remittances are considered as treatment, and propensity score matching allows for the comparability of treated and control groups by reducing the treatment assignment bias. Based on the regression analysis, I find evidence for the positive marginal impact of foreign remittances on more equal income distribution in Kyrgyzstan, though the effect is practically small. The separate estimation for the sub-sample of rural households finds that migration and remittances positively impact income inequality in rural areas, with the effect being similar to that estimated for the overall sample of households. Unfortunately, a very small number of urban migrant households does not allow for proper Propensity Score Matching estimation for the urban sub-sample.

Keywords: Migration, Remittances, Income inequality, Kyrgyzstan, Probit, Propensity Score Matching.

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INTRODUCTION

Migration is now an integral part of the globalized world we live in. According to the International Organization for Migration (IOM), there were about 281 million international migrants in the world as of 2020, including 169 million migrant workers (IOM, 2022). In the years ahead, migration pressures are expected to intensify due to a number of factors, including demographic trends, increased globalization and climate change (World Bank, 2019). This will result in a further increase in the international flow of remittances. Indeed, international remittances have become one of the most important resource flows to many developing countries and already reached $540 billion in 2020 surpassing the size of official development assistance (IOM, 2022).

Remittances play an important role for the Kyrgyz economy as well. Even though the top recipients of remittances are typically large countries such as India, China, and Mexico, as a percentage of GDP, the top recipients are small countries like Tonga, Lebanon and Kyrgyzstan, at 38%, 33% and 29% in 2020, respectively (World Bank, 2021). Despite the decrease in the flow of remittances to Kyrgyzstan relative to 2018 due to the adverse impact of the global COVID-19 pandemic, they amounted to more than $2.4 billion in 2020 (World Bank Indicators).

With remittances amounting to around twenty-nine percent of Kyrgyzstan's GDP, it is crucial to analyze their effect on the domestic economy. Unfortunately, the body of academic literature on remittances and their impact on various outcome variables of interest in Kyrgyzstan is relatively scant. In particular, the empirical evidence on the impact of remittances on income inequality remains inconclusive. One line of theoretical reasoning posits that international remittances may have a positive impact on income inequality. Another line of thought holds that remittances can have a detrimental effect on inequality.

The present study therefore aims to fill this gap in the literature and shed more light on the flow of international remittances in Kyrgyzstan using the micro-level dataset. The objectives of the study are: (i) to examine the impact of international remittances on income inequality in the country as measured by the Gini coefficient, (ii) to assess the magnitude of the impact through a measure of elasticity of the coefficient to a change in remittances, and (iii) to find out whether the impact is different in rural and urban areas.[1] The research applies the probit model and

[1] With a hindsight, the number of migrant households in urban sub-sample turned out to be insufficient to implement the proper propensity score matching procedure, and so the estimations have been performed only for the overall sample and the sub-sample of rural households.

propensity score matching (PSM) to construct the counterfactual scenario of no migration and no remittances in a selection-corrected estimation framework. Estimating the counterfactual income in turn allows to assess the impact of remittances on the degree of income inequality among recipient households by comparing the actual Gini coefficient to the Gini coefficient in a hypothetical case of no remittances. Importantly, such a counterfactual scenario takes into account the imputation for the home earnings of migrants had they stayed and worked at home. To achieve this, the research uses the latest available wave of the Life in Kyrgyzstan (LiK) survey conducted in the year 2016.

The hypothesis in this study is that international remittances tend to decrease the overall level of income inequality in Kyrgyzstan, as measured through the Gini index. This is related to the fact that most of the migrants in Kyrgyzstan come from rural areas, and rural residents tend to represent the low-income population of the country. Hence migration and the related inflow of remittances to migrant households left behind are expected to have an equalizing effect on overall income inequality. The second hypothesis is that remittances increase income inequality in rural areas, when we look at the impact of migration and remittances on the subsample of rural households. The reasoning behind this is that migrant households from rural areas are likely to be from an upper-income layer of the rural population due to the costs of migration (while migrant households from urban areas are likely to be from a lower-income layer of the urban population). Of course, the prediction for the rural sub-sample may not be true considering that the costs of migration also tend to fall as migration networks expand over time.

The rest of the paper is organized as follows. Chapter I presents theoretical considerations and summarizes the previous empirical findings in the academic literature. Chapter II gives a short background information on migration and the flow of remittances in Kyrgyzstan, describes the dataset and presents descriptive statistics. Chapter III is devoted to model specification and empirical results. The last section of the paper concludes and provides insights for further research.

CHAPTER I: Theoretical Background and Literature Review

I.1 Potential impact of remittances on income inequality

The impact of international remittances on income inequality is not unambiguous from a theoretical point of view. In particular, the impact on inequality would depend on which part of the income distribution migrants come from (Hundenborn 2014; Beyene 2012). On the one hand, remittances could decrease the level of income inequality if they flow towards the lower-income households. On the other hand, the impact on inequality could be adverse in case the recipients are higher-income households. These effects could also potentially change over time. Thus, the pioneering migrants, who are among the first to leave the country, may come from relatively high-income households, while subsequent migrants from lower-income households may benefit from falling costs of migration thanks to improved access to labor markets as migrant networks expand (Stark, Taylor and Yitzhaki, 1986; Arapi-Gjini et al., 2020; Koczan and Loyola, 2018). In this case, migration would first lead to an increase in income inequality in a migrant-sending country, but the effect would reverse itself later on. In a cross-sectional analysis, the researcher could hence observe a positive relationship between migration and inequality, if a country has a relatively short migration history (Stark, Taylor and Yitzhaki, 1988; Koczan and Loyola, 2018).

There are two possible explanations when remittances could increase inequality in the migrant-sending country. The first, as alluded above, relates to the high costs of migration, which prevents poorer households from sending their members as migrants abroad (Hundenborn, 2014). Secondly, it may also be the case that poorer households face higher opportunity costs of migration. If the potential migrant's labor is needed in the household more than potential financial assistance in the form of remittances, then opportunity costs can be too high thereby discouraging migration (Hundenborn, 2014). As Stark, Taylor and Yitzhaki (1986) argue, the impact of remittances on income inequality also depends on the size of remittance payments relative to other sources of income. This further emphasizes the complex effects of remittances on inequality.

Adams (1989) highlights the importance of geographical dimension of the flow of remittances. Given that income tends to be lower in rural areas compared to urban areas, the impact of international remittances is more likely to be beneficial when a substantial fraction of migrants come from rural areas of the country. In fact, besides the shortage of jobs, this disparity in income and wages is another reason that drives many rural residents to migrate in Kyrgyzstan.

I.2 Previous empirical findings

The academic interest in the relationship between remittances and income inequality in developing countries has become stronger as the size of remittances flows has increased incredibly over the last few decades. There is no consensus in the literature on the effect of remittances on income inequality.

Some authors find evidence for a negative impact, i.e., a larger inflow of remittances is associated with higher level of income inequality. Thus, Adams et al. (2008) look at the impact of internal and international remittances on poverty and inequality in Ghana and control for selection and endogeneity by using a two-stage multinomial logit model. The authors find that both internal and international remittances increase income inequality in Ghana, with the magnitude of the impact being larger for international remittances. Devkota (2014) applies the Heckman two-stage model to correct for selection bias and construct the counterfactual scenario of no remittances and finds that both international and internal remittances tend to widen inequality in Nepal. In particular, the Gini coefficient increases from 0.345 to 0.403 because of total remittances. The impact of external remittances is found to be greater than that of internal remittances.

Adams (1989) uses the data from a household survey for 1986-87 in Minya Governorate and finds evidence for the negative effect of remittances on income inequality in rural Egypt. In particular, the Gini coefficient of inequality increases from 0.236 to 0.271 when remittances are included. The findings hence suggest that remittances from abroad worsen rural household income distribution in rural Egypt, because they are earned mainly by upper income villagers. Arapi-Gjini et al. (2020) investigate the impact of remittances on households' income distribution using a cross-sectional dataset from the 2011 Kosovo Remittance Household Survey (KRHS). The study finds that remittances lead to a marginal increase in inequality in Kosovo with the change in Gini index from 0.35 to 0.36.

Leones and Feldman (1998) study the effect on inequality of nonfarm income sources, including remittances, in rural Philippines and find that remittances are responsible for almost half of the income inequality measured by the Gini coefficient. Overall, remittance income contributes more to the Gini coefficient than its share of total income indicates, and it tends to increase income inequality in the community. Barham and Boucher (1995) use the data from Nicaragua and also find that migration and remittances increase income inequality in the country when compared with the non-migration counterfactual.

Ravanilla and Robleza (2005) apply the decomposition analysis to the household survey data from Philippines and divide the total inequality into its four components: wages, entrepreneurial incomes, other income, and remittances from migrants. Remittances are found to accrue mostly to higher-income households thereby contributing to higher income inequality, but they are seen to be gradually becoming less inequality-increasing over time. Hobbs and Jameson (2012) use the World Bank's 2001 Living Standards Measurement Survey (LSMS) and find that remittances increase income inequality, likely because the middle class benefits from migration to US, while the poor migrants from Nicaragua tend to make it no farther than neighboring Costa Rica.

Another set of empirical papers suggest that remittances tend to reduce income inequality. Thus, Ahmed et al. (2010) use the 2010 household survey data from Pakistan and find evidence for the inequality-reducing effect of remittances. Zhu and Luo (2014) study the impact of migration on inequality in rural China and find that migration has an egalitarian effect on rural income. Zhu and Lao (2014) give three reasons for such an impact: (i) migration is rational self-selection, i.e., farmers with higher expected return in farming or local non-farm activities decide to remain in countryside, whereas farmers with higher expected return in urban non-farm sector migrate; (ii) households facing binding constraints due to land shortage are likelier to migrate; (iii) lower-income households benefit more from migration.

Odozi et al. (2010) find evidence for an equalizing effect of remittances on income inequality in Nigeria. In authors' view, migration helps the poor gain access to productive assets, because the conditions under which the poor operate are characterized by liquidity constraints, risk, missing markets for insurance and credit, poor governance and low investment in infrastructure. Hundenborn (2014) applies the decomposition of income sources to the South African National Income and Dynamics Survey (NIDS) and employs the conditional difference-in-difference matching for the construction of the counterfactual. Hundenborn finds that, while the degree of inequality as measured by the Gini index is lacking any significant improvement, there is a minor inequality-reducing effect of remittances. In particular, the study finds that a marginal increase in remittances of 1 percent leads to a decrease of 0.01 percent in income inequality.

Koczan and Loyola (2018) use the Mexican data to study the impact of remittances on income inequality before, during and in the aftermath of a domestic crisis, the 1994 Mexican peso crisis, as well as the Global Financial Crisis, which affected both the destination and origin countries of migrants. The authors find that remittances tend to lower inequality and that they become more

pro-poor over time as migration opportunities become more widespread. Mughal and Anwar (2012) find that international remittances have a beneficial effect on consumption inequality in Pakistan, with the contribution of international remittances in inequality reduction being larger than that of internal remittances. Remittances from North America are found to reduce consumption inequality most strongly.

Still other authors conclude that there is no impact of remittances or that the impact is inconclusive and also depends on whether internal or international remittances are studied. For example, Beyene (2012) studies the effect of international remittances on inequality in Ethiopia using a novel instrument of religion in the Heckman's two-stage selection method and finds that there is no impact of remittances on income inequality. Kimhi (2010) uses the 1992 Family Expenditure Survey in the Dominican Republic and finds that internal remittances tend to reduce income inequality, while the effect of international remittances is the opposite. However, the marginal effect on inequality of a uniform increase in remittances is negative for both domestic and international remittances. Domestic remittances have a stronger adverse marginal effect on rural landless households, whereas international remittances have a more prominent unequalizing impact on urban families. The author therefore concludes that the impact of remittances on inequality is far from being uniform across the population.

Taylor et al. (2005) use the data from the 2003 Mexico National Rural Household Survey and find that international remittances contribute to a slight increase in income inequality, whereas the effect of internal remittances is the opposite. In particular, a 10% increase in internal remittances reduces the Gini coefficient of total income by 0.1%, while a 10% increase in remittances from migrants abroad increases the Gini coefficient by about 0.3%. At the same time, in regions with highest shares of migrants, international remittances have an income equalizing effect (Northeast and West-Center region of Mexico). As the authors clarify, these findings are in line with the argument in Stark, Taylor and Yitzhaki (1986) that expansion of migration has an initially unequalizing effect on the rural income distribution, but the diffusion of access to migration eventually makes the effect of remittances on rural incomes more equitable (or at least, less inequitable). This may explain inconsistencies in the estimated effects of remittances on income inequality from existing studies, using data from economies with different levels of integration with migrant labor markets.

The research on migration and remittances in Kyrgyzstan suggest that remittances are mostly spent on investing in human capital of children, consumption, purchase of durable goods, and construction or renovation of houses (Mogilevskiy and Atamanov, 2008; Kroeger and Anderson, 2014; Aytimbetov, 2006; Ukueva 2010). Unfortunately, the empirical evidence on the relationship between remittances and income inequality in Kyrgyzstan remains inconclusive. For example, if international remittances are received by poorer households, they can be a mechanism for decreasing poverty and income inequality in the country. On the other hand, if mostly middle- and higher-income households tend to receive remittances, then remittances may negatively affect income inequality.

As McKenzie and Sasin (2007) mention in their article on the conceptual and empirical challenges in migration research, researchers interested in estimating the causal impact of migration and remittances on inequality or other outcome variables of interest need to tackle a variety of identification challenges, including endogeneity, selection bias and omitted variable bias. Most of the studies tackle these challenges with the use of instrumental variables, panel data, and propensity matching (Adams, Cuecuecha, and Page, 2008; Hundenborn, 2014; Möllers and Meyer, 2014; Arapi-Gjini, Möllers, and Herzfeld, 2020). The present research resorts to PSM and probit model to deal with a potential endogeneity of migration and remittances and selection bias.

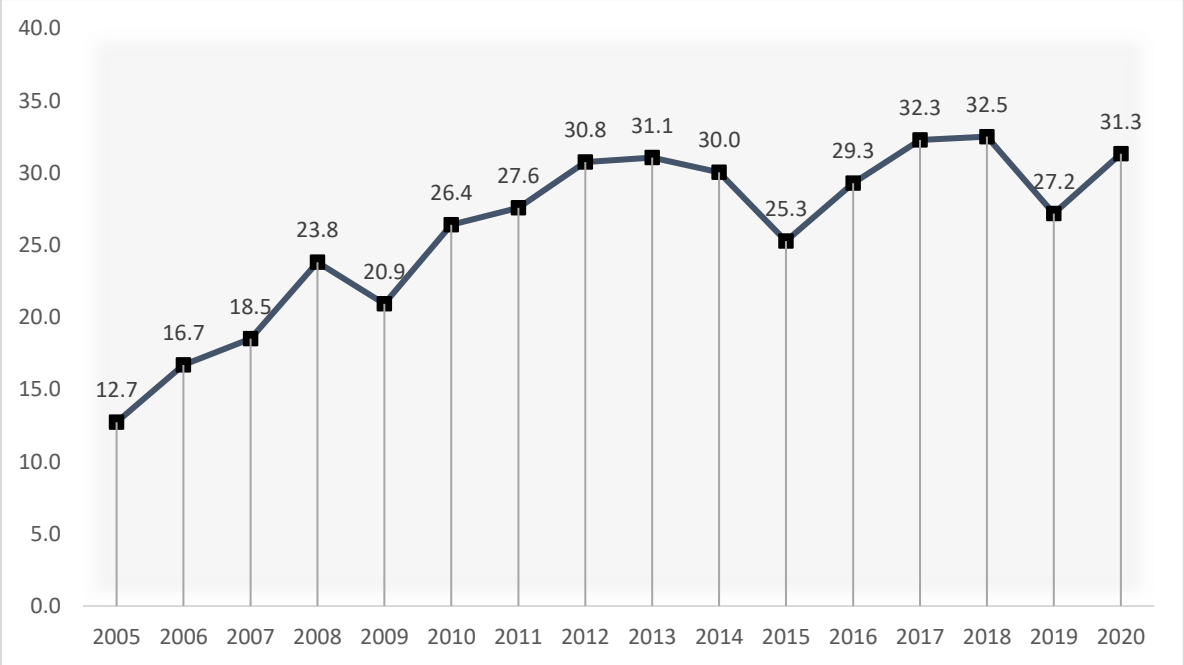
CHAPTER II: Background and Data Description

I.1 Migration and remittances flows in Kyrgyzstan

Kyrgyzstan represents a good setting to study the impact of migration and accompanying international remittances on income inequality in the remittance-recipient country. The out-migration from Kyrgyzstan has increased significantly since the country gained independence in 1991 after the break-up of the Soviet Union. In line with this trend in external migration, the amount of remittances flowing to Kyrgyzstan has increased substantially. As of 2020, the Kyrgyz Republic was the third most remittances-dependent country in the world with remittances being equivalent to 29% of GDP (World Bank, 2021). Figure 1 below shows the dynamics of remittances inflow to Kyrgyzstan as the percentage of the country's GDP from 2005 to 2020. We clearly observe an upward long-run trend in the flow of remittances despite a few short-lived periods when remittances decreased deviating from its long-run trajectory.[2]

Figure 1

Remittances to Kyrgyzstan over the period 2005-2020 (% of GDP)



Source: World Bank Indicators

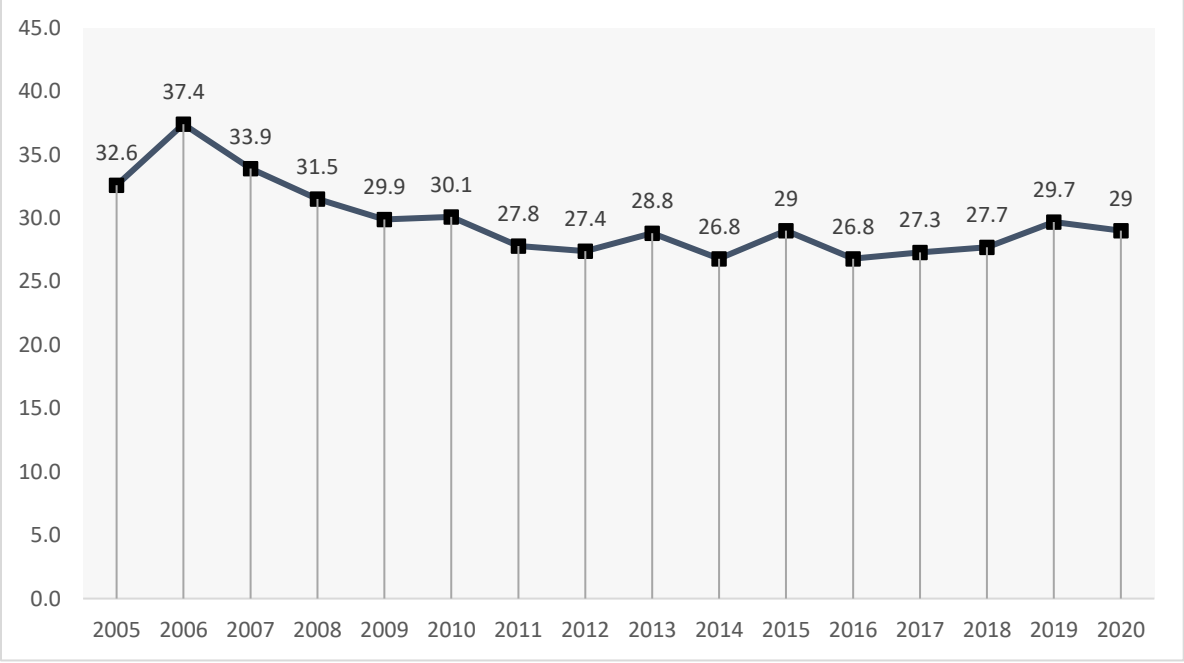
[2] The first drop in 2008 was due to the Global Financial Crisis, the second drop in 2014 was due to a significant devaluation of the ruble in Russia (remittances from Russia are mostly sent in rubles), and the third decline in 2019 was due to the imposition of limits in Russia on the amount of monetary transfers.

High migration rates in Kyrgyzstan are mainly motivated by economic factors. Thus, the PPP-adjusted per capita GDP in Kyrgyzstan was only $4,974 in 2020, the second lowest among the former Soviet republics (World Bank Indicators).[3] High unemployment rates, especially among the youth, have pushed many people into migration. At the same time, a substantial wage gap with Russia, Kazakhstan, Turkey, and United Arab Emirates and other destinations have served as an important "pull" factor for migrants from Kyrgyzstan. Among a number of different destination countries, Russia remains by far the most important, and migration to Russia was further facilitated by the entry of Kyrgyzstan into the Eurasian Economic Union (EEU) in 2015.

Figure 2 illustrates the Gini index for Kyrgyzstan over the period 2005-2020. It is clear from the figure that the Gini coefficient has declined only slightly over fifteen years. During the same period remittances have increased dramatically both in absolute value and as the share of GDP. While these are observations pertaining to the general trends in remittances and income inequality as measured by the Gini index, this is exactly the purpose of this research paper to identify any causal impact of remittances on the degree of income inequality in Kyrgyzstan.

Figure 2

Gini index over the period 2005-2020



Source: World Bank Indicators

[3] At $3,858 in 2020, only Tajikistan's GDP per capita was lower than that of Kyrgyzstan (World Bank Indicators).

II.2 "Life in Kyrgyzstan" dataset and descriptive statistics

The research utilizes the data from the Life in Kyrgyzstan survey (LiK), which was conducted by the efforts of DIW Berlin, Humboldt University of Berlin, CASE-Kyrgyzstan, and AUCA as part of the research project "Economic Transformation, Household Behavior and Well-Being in Central Asia: The Case of Kyrgyzstan". LiK is the multi-topic longitudinal survey that covers up to 3000 households annually over the period 2010-2013 and 2016[4]. The survey collects information through household, individual and community level questionnaires[5] and includes quite a detailed section on migration and remittances, along with other topics.[6]

The survey is representative at both the national and regional levels, and 3000 initial households are tracked in subsequent years. The survey designers used a stratified two-stage random sampling procedure to determine the initial sample. Specifically, the country was broken up into 16 strata (two cities of Bishkek and Osh plus urban and rural areas of seven oblasts), and the number of households in each stratum was determined proportionate to size of the stratum. Each stratum was divided into population points (communities in rural areas, districts in urban areas), and then twenty-five households were randomly drawn from each population point.

In the LiK survey, a household is defined as a domestic unit where all members "normally live together, eat their meals together and share their expenses". Due to the non-random nature of dropout households in the survey (i.e. sample attrition), I construct a cross-sectional dataset from the latest available wave of the survey, which is the year 2016. There are 2142 households in the year 2016 after merging all necessary data from multiple modules of the survey.

Table 1 shows the number of migrant households in each year of the survey and the percentage of these households in the overall number of households. Table 2 also shows the number of households that received remittances (in the form of cash and/or in-kind) as well as the percentage of these households among migrant households and among the total number of households. Besides the year 2016, I also choose to present the numbers for the years 2010-2013 for illustration. For the year 2016, the statistics are based on the merged cross-sectional dataset, and a number of observations have been dropped due to missing values for some of the variables.

[4] The survey was also implemented in 2019, but these data are currently unavailable due to embargo.

[5] In 2016, a separate agricultural questionnaire was also introduced in the survey.

[6] The description of the LiK survey in this section draws from the "Codebook for the Life in Kyrgyzstan survey" by Susan Steiner and Philipp Jäger.

Table 1

Migrant and non-migrant households, 2010-2013 and 2016

Year	2010	2011	2012	2013	2016
With at least one migrant	363	388	414	411	265
With no migrant members	2637	2475	2402	2173	1877
Migrant households, %	12.1%	13.6%	14.7%	15.9%	12.4%
Total number of of households	**3000**	**2863**	**2816**	**2584**	**2142**

Table 2

International remittances-receiving households, 2010-2013 and 2016

Year	2010	2011	2012	2013	2016
Recipient	299	347	363	356	239
Non-recipient	2701	2516	2453	2228	1903
Recipient households, %	10.0%	12.1%	12.9%	13.8%	11.2%
Recipient households as % of migrant households	82.4%	89.4%	87.7%	86.6%	90.2%
Total number of of households	**3000**	**2863**	**2816**	**2584**	**2142**

As discussed in more detail in the next section on methodology, it is crucial to control for all relevant factors across which the migrant and non-migrant households may systematically differ. The explanatory variables included in the model therefore control for a comprehensive list of factors, including household head characteristics, household composition and wealth, demographic and geographic characteristics. These variables may affect both incomes and motives of households' members to migrate and send remittances. For example, it might well be that households with more educated household heads are likely to have higher income and that these households are also more likely (or less likely) to send migrants abroad and receive remittances.

I also control for three types of shocks that are likely to be correlated with selection into migration and income level: the occurrence of a natural disaster, the job loss of any household member, and death of a major breadwinner. "Natural disaster" is coded as one if a household has been affected by any of the following: drought or very cold winter. In order to control for location-specific fixed effects, I include a dummy variable for each oblast in Kyrgyzstan (i.e., region) and the two main cities of Bishkek (the capital) and Osh (the largest city in southern Kyrgyzstan).

Table 3 provides descriptive statistics of explanatory variables categorized by migration status. Migrant households are more likely to have household heads that are older, married and males. The heads in these households tend be to relatively less educated (more likely to have secondary and less likely to have higher education). Migrant households have a larger size and greater number of children, more likely to own land and the main dwelling they live in and also likelier to reside in rural areas. The mean income difference of 36,813 suggests that migrant households have lower incomes, though it is not statistically significant. Since the mean difference for another housing is not statistically significant, I choose to exclude this variable from the model. But I include the dummy for "natural disaster", as the dummies for "drought" and "very cold winter" are actually statistically significant when tested separately. I also include the dummy for "death of a major breadwinner", as it may turn out to be statistically insignificant simply due to a small number of treated households in the dataset (it is close to being significant with a t-statistic of 1.601).

Table 3: Characteristics of households by migration status

Characteristics of households	**Overall sample**	**Non-migrant households**	**Migrant households**	**Difference**	**t-statistic**
Household head age	54.53	54.23	56.65	-2.42***	[-2.92]
Household head male	0.717	0.706	0.792	-0.086***	[-2.91]
Household head married	0.701	0.691	0.774	-0.083***	[-2.75]
Head with higher education	0.171	0.178	0.121	0.058**	[2.34]
Head with secondary education	0.793	0.787	0.834	-0.047*	[-1.75]
Head with primary education or illiterate	0.035	0.034	0.045	-0.011	[-0.92]
Annual income, excl. remittances, in KGS	321,746	326,300	289,487	36,813	[0.78]
Household size	5.458	5.210	7.219	-2.010***	[-12.62]
Number of children	1.850	1.815	2.098	-0.284***	[-2.73]
Land ownership	0.743	0.728	0.845	-0.117***	[-4.09]
Main dwelling	0.984	0.982	0.996	-0.014*	[-1.68]
Another housing	0.045	0.047	0.034	0.013	[0.95]
Urban	0.369	0.394	0.196	0.197***	[6.29]
Natural disaster	0.297	0.302	0.264	0.037	[1.247]
Job loss of h-hold member	0.057	0.053	0.083	-0.030**	[-1.957]
Death of a breadwinner	0.015	0.017	0.004	0.013	[1.601]
Number of observations	**2,142**	**1,877**	**265**	**-**	**-**

Standard deviations are omitted not to clutter the presentation, but t-statistics are provided in square brackets. *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Finally, the average yearly amount of remittances received by migrant households in 2016 is 158,893 soms. The amount of remittances is zero for non-migrant households, as there is no separate question on whether a household received any monetary transfers from abroad sent by migrants who are not members of a household. In fact, there was such a question in the first initial wave of the survey in 2010. But this section on remittances from non-household migrants was dropped from survey, as the number of households receiving such monetary transfers was literally seven, i.e. extremely low in the year 2010. Accordingly, for a household to be a remittances-recipient household, it must also be a migrant household (i.e., have at least one migrant member).

CHAPTER III: Empirical Methodology and Results

III.1 Model specification and identification strategy

The key issue in estimating the impact of migration and remittances on income inequality is how to properly estimate the hypothetical income for the treatment group of migrant households in case they did not have any migrant members and did not receive any remittances. This is the counterfactual scenario of no migration and no remittances that we do not observe from the actual data.

It would be a naïve approach to treat remittances as an exogenous source of income and simply set income from remittances equal to zero for the construction of the counterfactual. This would ignore how households would have compensated missing remittance income with income from other sources had their household members not migrated. Similarly naïve approach would be to estimate the counterfactual income of migrant households based on the incomes of non-migrant households, since the two types of households are likely to be systematically different because of self-selection into migration along certain characteristics.

Propensity score matching (PSM) effectively tackles this issue by allowing to find non-migrant households that are very similar to migrant households, assuming certain assumptions are satisfied[7]. The data on these matched non-migrant households can then be used to estimate income for households in the treatment group in non-migration scenario. The estimation of the counterfactual income levels in turn allows the computation of the Gini index in the hypothetical case of no migration and no remittances to be compared with the actual Gini index.

For a successful implementation of PSM, however, it is important to control for a full range of variables across which the treatment and comparison units might differ. Once all relevant characteristics can be observed and controlled for, untreated comparison units have the same outcomes that treated units would have in the absence of the treatment. The correct specification of the selection model is hence crucial, and all relevant covariates that relate to the treatment status and outcomes should be included in the model (Caliendo and Kopeinig, 2005).

[7] Two conditions have to be met to obtain reliable estimates from the propensity score matching. First, PSM requires *unconfoundedness* (or Conditional Independence Assumption), i.e., the variables on which the treated and untreated groups differ must all be observable to the researcher. Second, PSM requires *common support* (or overlap condition), i.e., there must be a positive probability of finding both a treated and untreated unit for each possible value of the vector of covariates X so that each treated unit can be matched with an untreated unit (Caliendo and Kopeinig, 2005).

More specifically, the estimation is performed in three steps. I first estimate the probability of selecting into migration using probit regression. The model is specified as follows:

Prob(migr) = f (hhmale, hhage, $hhage^2$, hhmarried, hheduc, hsize, numchildren, land, main_dwelling, natdisaster, jobloss, death_mb, urban, regional dummies);

where *migr* is a dummy variable equal to one if a household has at least one migrant member, and 0 otherwise (a household member is considered a migrant only if he/she has been abroad for at least a month during the last twelve months before the survey);

hhmale is a dummy variable equal to one if a household head is male, and 0 otherwise;

hhage is the age of a household head;

$hhage^2$ is the square of household head age to allow for a non-linear effect;

hhmarried is a dummy equal to one if a household is married, and 0 otherwise;

hheduc is the educational level of a household head;

hsize is the size of a household, i.e., the number of household members;

numchildren is the number of children (household members under the age of 18);

land is a dummy variable equal to one if a household owns any plot of land;

main_dwelling is a dummy equal to one if a household owns the dwelling in which it lives;

natdisaster is a dummy equal to one if a household experienced any of the two natural disasters, drought and/or very cold winter, during the last 12 months before the survey;

jobloss is a dummy equal to one if any household member lost a job during the last 12 months before the survey;

death_mb is a dummy equal to one if a household experienced a shock in the form of a death of a major breadwinner during the last 12 months before the survey;

urban is a dummy variable equal to 1 if a household resides in urban area;

regional dummies are dummies for each oblast in Kyrgyzstan and the two main cities of Bishkek and Osh, with Bishkek as base category.

The dummies for ownership of land and main dwelling are included to control for household wealth. Since it is important that the treatment variable (migration status) does not influence the covariates, I choose to include these variables as measures of household wealth. These are not likely to be affected by the migration status of households and the receipt of remittances.

The second step is to apply PSM and match treated units with units in the control group that are similar in their observed characteristics. The parameters from the first step are used to estimate the propensity score. Basically, the idea is to construct a counterfactual scenario and see what the status of a migrant household would have been had that household not selected into migration. PSM allows to control for non-random self-selection, and the outcome for comparable control units can then be interpreted as the counterfactual income of treated units (that we would observe in the absence of treatment). Following Arapi-Gjini, Möllers, and Herzfeld (2020), matching without replacement is implemented based on the *nearest neighbors* (NN) matching within specified caliper, and the caliper is calculated at 0.25*standard deviation of the propensity scores. Because the sample size is large enough, I use the NN algorithm with k=1. Common support condition is satisfied as reported by the estimation output in STATA (for the overall sample as well as rural sub-sample).

The outcome of interest is per capita income. Equivalized per capita income is used to take into consideration the non-proportional increase of expenditures with family size. In particular, the modified OECD equivalence scale is used (OECD, 2018): the coefficient of 1 is assigned to the household head, 0.5 to other adults in the household, and 0.3 to children under the age of 16. Income inequality is then estimated through the decomposition of Gini coefficients by the source of income (following Lerman and Yitzaki, 1985):

$$\sum_{k=1}^{K} R_k G_k S_k$$

where S_k is the share of component k (remittances in our case) in total income, G_k is the Gini coefficient of income distribution from source k, and R_k is the Gini correlation between income derived from source k with the total income distribution. Gini decomposition allows us to measure an elasticity of the Gini index to a percentage change in remittances income. Estimation in STATA is implemented with the use of *descogini* module.

Besides the estimation for the overall sample, I also ran separate regressions for the two sub-samples of urban and rural households. This would allow to identify the impact of migration and remittances on income inequality in rural and urban areas of the country and ensure that matching is implemented for observations in more similar economic environment. However, since there are only 51 migrant households in urban sub-sample, the common support assumption fails. I therefore only present the estimation results for the rural sub-sample.

III.2 Empirical results

Descriptive statistics of the variables in the PSM probit model are shown in Table A1 in Appendix, while Tables A2 and A3 presents the results of the probit regression on the basis of which we predict propensity scores measuring the probability of receiving remittances. The quality of matching is satisfactory as seen from the visual inspection of the standardized percentages bias before and after matching (Appendix, Figures A1 and A2). I also apply STATA's *pstest* command to estimate covariate percentage bias reductions that are shown in Tables A4 and A5 in Appendix.

Table 4 below presents the estimated treatment effects for the entire sample of 2,142 households. The Average Treatment Effect on the Treated (ATT) shows that the net impact of migration equals to an extra 25,018 soms per capita in a migrant household relative to a matched non-migrant household (though t-statistic is only 1.51). Table 5 presents the estimated effects for the rural sub-sample. The ATT is estimated to be 42,758 for the rural sub-sample, much larger than the ATT for the overall sample.

Table 4: Estimated treatment effects on recipient households, overall sample

Variable		Treated	Controls	Difference	Std. error	t-stat
Equivalized income,	Unmatched	124,054	121,064	2,990	14,655	0.20
incl. remittances	ATT	124,054	99,037	**25,018**	16,583	1.51

Source: Author's own calculation based on the LiK 2016 data.

Table 5: Estimated treatment effects on rural households

Variable		Treated	Controls	Difference	Std. error	t-stat
Rural sample						
Equivalized income,	Unmatched	132,056	121,989	10,067	19,678	0.51
incl. remittances	ATT	132,056	89,298	**42,758**	19,858	2.15

Source: Author's own calculation based on the LiK 2016 data.

Table 6 shows the Gini coefficients for the equivalized per capita income and the counterfactual equivalized income obtained by imputing income values from matched control units to the treated units. For the overall sample, the Gini coefficient based on the OECD equalized per capita income is as high as 0.526, while the Gini coefficient based on the counterfactual equivalized income is only slightly smaller at 0.525. Therefore, we observe that the Gini coefficient decreases by only about 0.001 when we look at the equalized counterfactual income, a negligible difference.

The estimate of 0.9473 indicates the Gini coefficient for remittances, i.e. the coefficient calculated based on the income distribution from remittances, and this is close to 1 because only a small fraction of households receive remittances. The number in parentheses is the estimated elasticity, i.e., it gives the percentage change in the Gini coefficient resulting from a 1% percentage change in remittances. Thus, an increase of 1% in the amount of remittances received has a negative effect on the Gini coefficient of about 1%, not a very large effect. I therefore find evidence that the flow of remittances leads to a marginal decrease in income inequality.

Table 6: Income distribution and remittances, overall sample

	All households
Gini coefficient	
- equivalized per capita income	0.526
- counterfactual income	0.525
Decomposed Gini coefficient	
- on the basis of remittances	0.9473 (-0.011)

Source: Author's own calculation based on the LiK 2016 data.

Table 7 does the same for the sub-sample of rural households. We observe that the Gini coefficient based on equalized per capita income is 0.590, while the Gini coefficient based on the counterfactual equivalized income is 0.585, a difference of only 0.005 (or 0.5% when the Gini is converted into percentage). The estimated elasticity shows that a 1% increase in remittances to rural households decreases income inequality by about 1%, which is similar to the impact we found for the overall sample of households.

Table 7: Income distribution and remittances, rural sub-sample

	Rural households
Gini coefficient	
- equivalized per capita income	0.590
- counterfactual income	0.585
Decomposed Gini coefficient	
- on the basis of remittances	0.9338 (-0.0102)

Source: Author's own calculation based on the LiK 2016 data.

It should also be noted that, while the Gini coefficients for the overall sample are in the ballpark of 0.52-0.53, the estimated Gini coefficients for the rural sub-sample are as high as 0.58-0.59. This suggests that the degree of income inequality is substantially higher in rural areas relative to urban areas of the country.

CONCLUSION

Kyrgyzstan represents an interesting case study of the impact of migration and remittances on income inequality. External migration in Kyrgyzstan has increased significantly since the country gained independence with break-up of the Soviet Union in 1991. Not only a large number of ethnic Russians were leaving the country during the 1990s and later on for their historical motherland, but also a significant number of other Kyrgyzstanis started looking for better employment opportunities outside the country, with their primary country of destination being Russia due to strong historical ties and the absence of significant language barriers. In line with these migratory trends, the flow of remittances to Kyrgyzstan has become a crucial source of funds, reaching the amount equivalent to as much as 29% of the country's GDP.

Unfortunately, despite their importance to many recipient households, especially in rural areas, remittances are not widely researched and their impact on various outcome variables of interest is still inconclusive and ambiguous. For these reasons, the present study has attempted to analyze the impact of migration and the related flow of international remittances on income inequality (measured through the Gini index) based on the latest available data from the LiK survey. Using probit model and propensity score matching technique, we find that remittances lead to a marginal decrease in income inequality in Kyrgyzstan, though the impact is not practically significant.

The application of probit and PSM technique to the sub-sample of rural households shows that there is a marginal negative effect of migration and remittances on income inequality, with the elasticity measure being comparable in magnitude to that for the overall sample of households. Thus, remittances tend to slightly decrease income inequality in rural areas. Unfortunately, the small number of households in the urban sub-sample makes it impossible to reliably estimate the impact of migration and remittances on income inequality among urban households.

There are a number of dimensions along which it would be possible to improve the present study on migration and remittances. First, it would be a great idea to look at the impact of internal transfers on income inequality rather than restraining our interest to international remittances only. Potentially, the magnitude of international and internal remittances' impact may be quite different or even opposing. Second, the scope of the topic could also be extended to the related issue of remittances' impact on poverty level in Kyrgyzstan.

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APPENDIX

Table A1: Descriptive statistics of variables in the PSM probit model, overall sample

Independent variables		Mean, percentage share (for dummies)	Standard deviation
hhmale	Household head male	0.717	0.451
hhage	Age of household head	54.528	12.661
hhmarried	Household head married	0.701	0.458
i.hheduc:	Educational level of household head:		
	- primary or illiterate	0.04	0.19
	- basic, secondary general or secondary technical education	0.79	0.41
	- university or above	0.17	0.38
h_size	Household size	5.458	2.515
numchildren	Number of children	1.850	1.587
land	Ownership of land	0.743	0.437
main dwelling	Ownership of the main dwelling	0.984	0.125
natdisaster	Drought or very cold winter	0.297	0.457
jobloss	Job loss of any household member	0.057	0.232
death_mb	Death of a major breadwinner	0.015	0.121
urban	Residence in urban vs. rural areas	0.369	0.483
i.oblast	Oblast (region) of residence:		
	- Issyk-Kul	0.102	0.303
	- Djalal-Abad	0.184	0.388
	- Naryn	0.048	0.214
	- Batken	0.093	0.291
	- Osh	0.182	0.386
	- Talas	0.052	0.222
	- Chui	0.144	0.351
	- Bishkek city	0.151	0.358
	- Osh city	0.043	0.204

Source: Author's own calculation based on the LiK 2016 data.

Table A2: PSM probit results, overall sample

Independent variables	Coefficient	Std. error	z	P>|z|	95% confidence interval	
hhmale	-0.066	0.179	-0.37	0.714	-0.416	0.285
hhage	0.044	0.026	1.70	0.090	-0.007	0.094
hhage_sq	-4.3e-04	2.2e-04	-1.92	0.055	-0.001	9.2e-06
hhmarried	0.026	0.176	0.15	0.881	-0.318	0.371
hheduc:						
- basic or secondary general	-0.221	0.200	-1.10	0.271	-0.613	0.172
- primary or secondary technical	-0.217	0.222	-0.98	0.328	-0.652	0.218
- university or above	-0.220	0.221	-0.99	0.321	-0.654	0.214
h_size	0.324	0.028	11.61	0.000	0.269	0.379
numchildren	-0.380	0.044	-8.55	0.000	-0.467	-0.293
land	-0.303	0.115	-2.64	0.008	-0.529	-0.078
main_dwelling	0.947	0.420	2.25	0.024	0.123	1.770
natdisaster	-0.250	0.105	-2.37	0.018	-0.457	-0.043
job loss	0.127	0.169	0.75	0.452	-0.204	0.457
death of breadwinner	-0.846	0.486	-1.74	0.082	-1.798	0.106
urban	-0.246	0.118	-2.09	0.037	-0.478	0.015
oblast:						
- Issyk-Kul	0.289	0.233	1.24	0.214	-0.167	0.746
- Djalal-Abad	0.374	0.199	1.88	0.060	-0.016	0.764
- Naryn	-0.064	0.327	-0.20	0.844	-0.706	0.577
- Batken	0.792	0.225	3.51	0.000	0.350	1.234
- Osh	1.010	0.203	4.99	0.000	0.613	1.408
- Talas	0.885	0.231	3.83	0.000	0.432	1.337
- Chui	-0.102	0.230	-0.45	0.656	-0.552	0.348
- Osh city	0.223	0.258	0.86	0.388	-0.283	0.728
_cons	-4.235	0.829	-5.11	0.000	-5.859	-2.611

Source: Author's own calculation based on the LiK 2016 data.

Table A3: PSM probit results, rural sub-sample

Independent variables	Coefficient	Std. error	z	P>|z|	95% confidence interval	
hhmale	-0.323	0.223	-1.45	0.146	-0.759	0.113
hhage	0.020	0.029	0.69	0.490	-0.037	0.078
hhage_sq	-3e-04	3e-04	-1.07	0.286	-8e-04	3e-04
hhmarried	0.026	0.176	0.15	0.881	-0.318	0.371
hheduc:						
- basic or secondary general	-0.200	0.227	-0.88	0.378	-0.644	0.244
- primary or secondary technical	-0.035	0.256	-0.14	0.892	-0.537	0.468
- university or above	-0.217	0.263	-0.82	0.410	-0.732	0.299
h_size	0.332	0.034	9.69	0.000	0.265	0.399
numchildren	-0.380	0.052	-7.32	0.000	-0.482	-0.278
land	0.079	0.196	0.40	0.688	-0.306	0.463
main_dwelling	0.884	0.449	1.97	0.049	0.004	1.765
natdisaster	-0.358	0.112	-3.18	0.001	-0.578	-0.138
job loss	0.145	0.186	0.78	0.436	-0.219	0.509
death of breadwinner	-0.894	0.493	-1.81	0.070	-1.860	0.072
oblast:						
- Issyk-Kul	0.499	0.248	2.02	0.044	0.014	0.985
- Djalal-Abad	0.549	0.192	2.86	0.004	0.173	0.925
- Naryn	0.270	0.330	0.82	0.413	-0.376	0.916
- Batken	1.002	0.226	4.44	0.000	0.560	1.445
- Osh	1.220	0.181	6.74	0.000	0.864	1.574
- Talas	1.038	0.223	4.66	0.000	0.601	1.475
_cons	-3.936	0.934	-4.22	0.000	-5.765	-2.106

Source: Author's own calculation based on the LiK 2016 data.

Table A4: Testing of balance of covariates and absolute bias reduction

Variable	Unmatched Matched	Mean Treated	Mean Control	% bias	% reduction in bias	t-test t	t-test p>|t|
hhmale	U	0.79	0.71	19.9		2.91	0.004
	M	0.79	0.78	1.7	91.2	0.21	0.832
hhage	U	56.65	54.23	20.8		2.92	0.004
	M	56.65	56.28	3.2	84.9	0.43	0.668
hhage_sq	U	3310.8	3108.5	15.0		2.15	0.032
	M	3310.8	3258.8	3.9	74.3	0.51	0.609
hhmarried	U	0.77	0.69	18.7		2.75	0.006
	M	0.77	0.76	3.4	81.7	0.41	0.682

secondary general	U	0.71	0.62	18.2		2.71	0.007
	M	0.71	0.68	6.4	64.7	0.75	0.452
primary or sec. technical	U	0.12	0.16	-11.1		-1.63	0.104
	M	0.12	0.14	-5.4	51.7	-0.64	0.525
university or above	U	0.12	0.18	-16.2		-2.34	0.000
	M	0.12	0.13	-3.2	80.4	-0.39	0.696
h_size	U	7.22	5.21	79.9		12.62	0.000
	M	7.22	7.03	7.4	90.8	0.79	0.430
numchildren	U	2.10	1.81	17.5		2.73	0.006
	M	2.10	2.09	0.5	97.3	0.05	0.959
land	U	0.85	0.73	28.8		4.09	0.000
	M	0.85	0.82	5.6	80.6	0.70	0.485
main_dwelling	U	0.996	0.98	13.5		1.68	0.092
	M	0.996	1.0	-3.7	72.7	-1.00	0.318
s_natdisaster	U	0.26	0.30	-8.3		-1.25	0.213
	M	0.26	0.33	-15.1	-81.6	-1.71	0.088
s_jobloss	U	0.08	0.05	11.8		1.96	0.051
	M	0.08	0.09	-3.0	74.6	-0.31	0.758
s_death_mb	U	0.004	0.117	-12.7		-1.60	0.110
	M	0.004	0.00	3.8	70.4	1.00	0.318
urban	U	0.20	0.39	-44.3		-6.29	0.000
	M	0.20	0.21	-3.4	92.4	-0.43	0.667
Issyk-Kul	U	0.04	0.11	-28.3		-3.71	0.000
	M	0.04	0.05	-2.9	89.7	-0.43	0.664
Djalal-Abad	U	0.17	0.19	-3.1		-0.46	0.642
	M	0.17	0.14	8.8	-187.4	1.07	0.283
Naryn	U	0.01	0.05	-23.9		-2.99	0.000
	M	0.01	0.00	4.3	82.0	1.00	0.316
Batken	U	0.12	0.09	11.5		1.86	0.063
	M	0.12	0.15	-7.3	36.3	-0.76	0.448
Osh	U	0.45	0.14	69.8		12.30	0.000
	M	0.45	0.44	0.9	98.7	0.09	0.930
Talas	U	0.08	0.05	12.8		2.15	0.031
	M	0.08	0.07	3.1	75.9	0.33	0.743
Chui	U	0.06	0.16	-32.8		-4.36	0.000
	M	0.06	0.06	-1.2	96.2	-0.18	0.853
Osh city	U	0.03	0.05	-7.9		-1.13	0.259
	M	0.03	0.03	2.0	75.0	0.26	0.794

Source: Author's own calculation based on the LiK 2016 data.

Table A5: R2 of raw and matched models

Sample	Pseudo R2	LR chi2	p>chi2	Mean bias	Median bias
Unmatched	0.236	378.32	0.000	22.9	17.5
Matched	0.015	11.02	0.962	4.3	3.4

Source: Author's own calculation based on the LiK 2016 data.

Figure A1: Standardized percentage bias before and after matching

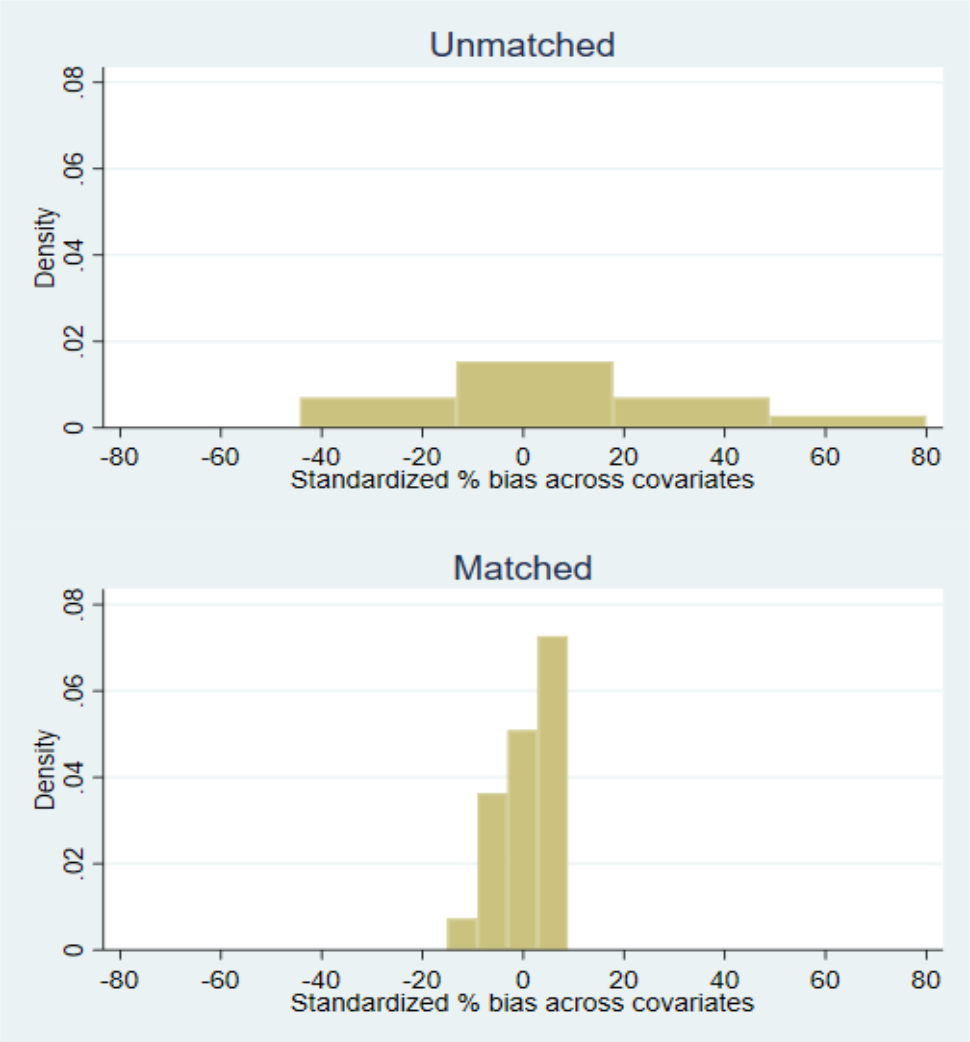

Figure A2: Standardized percentage bias before and after matching