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Abstract

This thesis explores the effects of international migration on human capital formation in countries of origin. The first chapter investigates the short-run effect of paternal absence due to circular migration on the perseverance skills of children left behind. Using exogenous variation in the timing of return migration induced by bilateral migration laws between Ukraine and Poland, I show that paternal absence due to circular migration negatively affects the perseverance skills of children left behind in Ukraine. This result is not explained by cognitive skills and is robust to including school and classroom fixed effects.

The second chapter (jointly with Bohdana Kurylo) examines the impact of international migration opportunities on the composition of origin-country skills by exploiting changes in migration opportunities induced by visa liberalization between EU countries and Ukraine. Our results suggest that greater opportunities to emigrate to EU countries increased the probability that Ukrainian high-school students will choose subjects that are more likely to lead to internationally transferable skills. We find no evidence that greater opportunities to emigrate to the EU significantly affect student performance or the probability of failing exams in subjects that are likely to lead to more internationally transferable skills. This suggests that the observed increase in the share of students choosing more internationally transferable subjects was not accompanied by a decrease in student performance or in the competitiveness of the study programs.

The third chapter (jointly with Geghetsik Afunts and Mariola Pytlikova) uses across-region variation in exposure to the sharp fall in the value of the Russian ruble in 2014 to examine the impact of remittances on classroom-level educational performance in Armenia. We find that the 2014 decrease in the value of remittances significantly decreased the performance of 12th-grade students in math. The negative effect was larger for boys than for girls. We provide suggestive evidence that this is likely driven by an increase in employment for boys relative to girls, as boys are more likely to engage in paid work to compensate for a

loss of income due to reduced remittances. However, we find no evidence that changes in remittances affected the performance of fourth- and ninth-grade students.

Introduction

This thesis includes three chapters that investigate the impact of international migration, migration opportunities, and financial remittances on human capital development in countries of origin.

The first chapter focuses on examining the short-term consequences of paternal absence resulting from circular migration on the socio-emotional skills of children left behind. Parental absence due to circular migration may disrupt parent-child bonds and decrease parental time inputs. In this chapter, I specifically concentrate on one socio-emotional skill: perseverance to setbacks. Perseverance enables one to overcome obstacles and consistently invest effort in challenging tasks. It serves as a predictor for various economic and educational outcomes, including job retention, academic performance, high school graduation, and college completion (Alan, Boneva, & Ertac, 2019; Credé, Tynan, & Harms, 2017; Duckworth & Quinn, 2009; Galla et al., 2014).

To address the endogeneity of the migration decision, I build upon previous research and concentrate on children whose fathers recently engaged in circular migration. Moreover, by leveraging exogenous variation in the timing of return migration induced by bilateral migration laws between Ukraine and Poland, I mitigate biases associated with paternal return migration decisions. The key findings of this chapter support the hypothesis that the current absence of fathers due to circular migration has a negative impact on the perseverance skills of their children. Specifically, children whose fathers are still working abroad exhibit a decrease of approximately seven percentage points in the likelihood that they will choose to take on challenging, high-reward tasks after receiving negative performance feedback, in comparison to children whose fathers have recently returned home. These findings hold even after controlling for cognitive skills and incorporating school and classroom fixed effects. Overall, these results indicate that circular migration does not necessarily provide a "triple-win" solution that benefits all parties involved.

The second chapter (jointly with Bohdana Kurylo) examines the impact of international migration opportunities on skills composition in the origin country. We study how an increase in migration opportunities due to a visa liberalization policy between EU countries and Ukraine affects investments in the origin country-specific and internationally transferable skills of Ukrainian high-school graduates. We use individual-level data from the universe of the high-school student subject choice for Independent External Tests (IET) held from 2016 to 2019 in Ukraine to measure origin country-specific and internationally transferable skills. IET exams are standardized high-stakes exams that have the same status as university entrance exams. Focusing on the student subject choice on IET exams also allows us to shed light on the impacts of migration opportunities on the tertiary education decisions of students and their parents.

We exploit the variation across regions of Ukraine in exposure to the 2017 EU visa liberalization policy induced by past emigration aspirations to EU states, to identify the causal effect of the increase in migration opportunities. The results of this chapter suggest that greater opportunities to emigrate to EU states increased the probability that students will choose subjects that are likely to lead to more internationally transferable skills, such as math. Students tended to switch from more origin country-specific subjects, such as Ukrainian history, increasing the human capital stock of internationally more transferable skills and decreasing the stock of country-specific skills in the origin country. We find no evidence that greater opportunities to emigrate to the EU significantly affect student performance or the probability of failing exams in subjects that are likely to lead to more internationally transferable skills.

The third chapter (jointly with Geghetsik Afunts and Mariola Pytlikova) utilizes class-school-level administrative data to examine the impact of seasonal migration on the educational performance of children left behind in Armenia. By focusing on classroom-level performance, we can analyze the peer effects of left-behind children on their non-left-behind classmates. To identify the effect of remittances on children's educational performance in their

home communities, we take advantage of the variation in exposure to the sharp devaluation of the Russian ruble following Russia's annexation of Crimea in March 2014. Different regions in Armenia show significant variations in terms of the proportion of the population engaged in seasonal work in Russia before the ruble devaluation. Leveraging this heterogeneity in exposure to the devaluation across regions, we employ a Difference in Differences estimation strategy to obtain a causal estimate of the impact of remittances on student performance in school.

The findings of the third chapter indicate that the 2014 devaluation of the ruble did not have a significant effect on the math performance of fourth- and ninth-grade students. However, it did have a notable negative impact on the math performance of 12th-grade students. Foreign language performance remained unaffected in the final grade. Furthermore, the negative effect was more pronounced among boys than girls. Although data limitations prevent us from precisely identifying the underlying mechanisms, we speculate on several potential explanations for the differential effects of remittances based on gender, age, and subject. First, on average, boys are more likely to seek paid employment to compensate for the loss of income resulting from reduced remittances. We offer suggestive evidence that the increase in employment among boys relative to girls likely drives the gender differences observed in the effect of remittances.

Second, older students are more capable of engaging in paid work than are younger students. Therefore, if changes in student employment primarily drive the impact of the Russian ruble's fall on schoolchildren, the absence of any significant effect on the performance of younger students is not surprising. Furthermore, it is worth noting that, on average, boys are less likely to choose to take foreign language exams and consistently underperformed girls in language subjects even prior to the ruble devaluation. Considering the larger negative effect observed in boys, it is unsurprising to find a negative impact in math but not in foreign languages. These observations provide insights into how adverse shocks in destination countries can influence the development of human capital in regions that serve as seasonal

migrant-sending areas. Overall, our findings contribute to understanding of ways that unfavorable events in host countries can affect human capital development in areas where seasonal migration is prevalent.

1 Chapter

Paternal Circular Migration and Development of Socio-Emotional Skills of Children Left Behind

Abstract

The study of how paternal absence due to circular migration affects the socio-emotional skills of children left behind is complicated by the potentially offsetting effects of fathers' absences and remittances. To isolate the effect of a father's absence, this paper focuses on remittance-receiving households and compares children whose fathers were at home with children whose fathers were still working abroad. Using data from a parent-child linked survey and experiment conducted in Fall 2019 in the Ternopil region of Ukraine, this paper finds evidence of the negative effect of a father's current absence on children's perseverance skills. Overall, this result suggests that circular migration is not necessarily a "triple-win" solution that benefits all involved parties. Indeed it can generate unintended consequences for the development of the socio-emotional skills of children left behind if not combined with complementary initiatives aimed at providing high-quality schooling in origin countries.

JEL codes: F22, O15, J24

Keywords: Circular migration, Children left behind, Perseverance skills, Formation of socio-emotional skills

1.1 Introduction

Circular migration is a widespread phenomenon. In Ukraine, approximately fifteen percent of the working-age population are partially working abroad, leaving their families and children behind (Libanova et al., 2019). A similar pattern is observed in other Post-Soviet and Latin American countries (Di Bartolomeo, Makaryan, Mananashvili, & Weinar, 2012). Circular migration has long been considered a "triple-win" solution that benefits destination and origin countries and increases the income of circular migrant workers (Agunias & Newland, 2007; Gibson & McKenzie, 2014). Previous studies find strong evidence that an increase in income due to temporary parental migration positively affects educational expenditures and the school enrolment of their children (Clemens & Tiongson, 2017; Theoharides, 2018; Yang, 2008). However, circular migration is often associated with a temporary absence of one or both of the parents. The early childhood development literature clearly emphasizes the importance of parental involvement, especially for the development of the socio-emotional skills of children (Agostinelli & Sorrenti, 2018; Bono, Francesconi, Kelly, & Sacker, 2016; Del Boca, Flinn, & Wiswall, 2014; Heckman & Mosso, 2014; Kautz, Heckman, Diris, Ter Weel, & Borghans, 2014). Therefore, it is important to examine whether (in addition to the positive effects of remittances) the circular migration of parents has negative effects for children left behind.

This paper focuses on one such socio-emotional skill – perseverance to setbacks – and adds to the existing literature by exploring the short-run effect of current paternal absence due to circular migration on the perseverance skills of their children left behind. Perseverance to setbacks is a socio-emotional skill that may be broadly defined as the ability to overcome setbacks and consistently exert high effort on challenging tasks. It predicts various economic and schooling outcomes such as job retention, academic performance, and high school and college graduation (Alan et al., 2019; Credé et al., 2017; Duckworth & Quinn, 2009; Galla et al., 2014). Furthermore, parental involvement and encouragement are among the most

important determinants of the perseverance skills of children, especially at younger ages. The absence of parents is one of the most extreme forms of lack of parental involvement. Therefore, it is essential to understand how parental absence due to migration affects the perseverance skills of their children left behind.

The study of how paternal absence due to circular migration affects the socio-emotional skills of their children left behind is complicated by the potentially offsetting effects of fathers' absences and an increase in household income due to remittances. Furthermore, both the out-migration and return-migration decisions of fathers are likely to be endogenous with respect to their children's socio-emotional skills. To estimate the causal effect of current paternal absence one needs to estimate the counterfactual child outcomes for children whose fathers are currently away. The ideal control group would include children whose fathers are also seasonal migrants but have returned during the survey period due to random reasons. In the paper, as a substitute for the 'ideal' control group, I utilize the outcomes of children whose fathers have also recently migrated but have already returned home during the time of the survey. As discussed in detail in (Antman, 2011a) and Antman (Antman, 2015), focusing on households with recent migration experience eliminates the bias associated with the endogeneity of out-migration decisions. This strategy also allows me to identify the effect of the current absence of fathers due to circular migration, net of the effects of an increase in household income due to remittances, which are likely to be the same for children whose fathers are also circular migrants but who have recently returned home.

To address the issue of the endogeneity of return migration, I also take advantage of the quasi-experimental variation in the duration of circular migration induced by bilateral migration laws between Ukraine and Poland. Specifically, I focus on the circular migrant workers from the Ternopil region in western Ukraine, whose primary destination is Poland. Short-term migrant workers from Ukraine cannot stay in Poland longer than nine months in a calendar year. This restriction helps to overcome the issue of the endogeneity of the decision to return because the majority of circular migrants tend to remain abroad as long as

they are legally allowed to do so. It is important to note that, because I compare children whose fathers were at home during the time of the survey with those whose fathers were still working abroad, this strategy identifies only the temporary effect of current paternal absence due to circular migration. However, understanding the temporary effect of current parental absence is essential because skill formation is a dynamic process, and even temporary but repetitive shocks may have crucial long-term consequences for child development (Evans, 2004; Macours & Vakis, 2010).

Overall, the findings of this study support the hypothesis that current paternal absence due to circular migration negatively affects one of the core aspects of children’s perseverance skills –the choice between a challenging high-reward and an easy low-reward task in response to the setback. Specifically, my estimation results reveal that children whose fathers are still working abroad are approximately eight percentage points less likely to choose challenging high-reward tasks after receiving negative performance feedback than children whose fathers have recently returned home. This effect is sizable since the probability of choosing a challenging high-reward task after failure is approximately forty percent for students in the control group. These findings are not explained by differences in cognitive skills and are robust to the inclusion of school and classroom fixed effects and different model specifications. Therefore, the differential sorting of children from circular migrant households across schools and classrooms does not drive my results.

The findings of this study have two main implications. First, the harmful effects of temporary parental absence due to migration extend beyond grade progression and time devoted to educational activities and have negative effect on socio-emotional skills of children from circular migrant families. Socio-emotional skills significantly affect children’s success and human capital formation. Therefore, studies that exclusively rely on achievement tests or school enrolment as a measure of a child’s human capital development are likely to underestimate the overall effect of temporary parental absence due to migration. Second, this study provides empirical evidence suggesting that circular migration is not necessarily a “triple-

win” solution that benefits all involved parties. It can generate unintended consequences for the development of socio-emotional skills of children left behind if not combined with complementary initiatives aimed at providing high-quality schooling in origin countries.

This paper contributes to existing literature in the following ways. First, although there is extensive work on the effects of parental migration on the schooling and educational outcomes of their children left behind (Clifton-Sprigg, 2019; Constant, Nottmeyer, & Zimmermann, 2013; Davis & Brazil, 2016; De La Garza, 2010; Mao, Zang, & Zhang, 2020; McKenzie & Rapoport, 2011), there is little empirical evidence on how parental absence due to circular migration affects the socio-emotional skills of children left behind¹. This is true even though socio-emotional skills are sensitive to changes in parental involvement and have a significant effect on children’s human capital formation and economic performance later in life (Heckman & Mosso, 2014; Kautz et al., 2014). Therefore, it is important to understand how parental absence due to migration affects the socio-emotional skills of their children left behind.

Second, although there are several studies that examine the effect of maternal labor supply (maternal time inputs) during childhood on the development of cognitive and socio-emotional skills of children (Agostinelli & Sorrenti, 2018; Carneiro & Rodrigues, 2009; Løken, Lommerud, & Reiso, 2018), the effect of paternal labor supply receive less attention in the literature overall. This paper contributes to this literature by investigating the effects of paternal labor supply in the context of circular migration. The fact that many children in developing countries have circular migrant fathers highlights the importance of this analysis.

The remainder of this paper is organized as follows. Section 2 describes the institutional setting and data used for the empirical analysis. Section 3 discusses empirical specification and identification assumptions. Section 4 presents the estimation results and robustness checks and Section 5 concludes.

¹Jiang and Yang (2019) is an exception that studies the effects of internal parental migration on internalizing and externalizing behaviour of left behind children in China.

1.2 Institutional Setting and Data

1.2.1 Circular Migration in Ukraine

Circular migration is one of the key sources of income for a considerable part of the Ukrainian population, particularly in the western regions of the country. According to a recent study conducted by Libanova et al. (2019), the number of Ukrainian short-term labor migrants simultaneously working abroad is approximately 3 million individuals (or around 8 percent of the total population). Many of these circular workers are married men who have families and young children left behind. For the majority of circular migrant workers from Ukraine, the average duration of one trip does not exceed three months. However, they usually take several trips a year (see Libanova et al. (2019), page 315). Due to geographic proximity and high wage differentials, Poland is the primary destination for circular labor migrants from western Ukraine. In 2018, 133,029 individuals from Ukraine received a short-term work permit in Poland, which represents approximately one-third of all work permits issued to migrant workers from Ukraine in Poland (Polish Ministry of Labour and Social Policy, 2018).

As of 2018, the duration of circular labour migration between Ukraine and Poland is regulated by bilateral migration laws between Ukraine and Poland, which restrict the length of circular labour migration to nine months in a calendar year. Because the vast majority of circular migrants stay abroad as long as they are legally permitted to, this restriction in the duration of circular migration creates quasi-experimental variation in the timing of return migration, which enables us to address the concerns associated with the endogeneity of return migration. Put simply, whether a recent circular migrant father² was at home when the survey was conducted depends primarily on when he left Ukraine. So long as the date of departure is not endogenous with respect to their children's perseverance skills, this restriction in the duration of maximum stay allows me to overcome issues related to the endogeneity of return migration decisions. Therefore, Ukraine is a worthy example to

²Recent circular migrants are those who became circular migrants in 2019 and had no prior circular migration history

consider the effect of circular migration of fathers on the socio-emotional development of their children left behind.

1.2.2 Data

I obtained unique data for this analysis by conducting a parent-child linked survey and experiment in cooperation with the local NGO "Center for Empirical and Economic Research (CEER)" and the support of Ternopil National Economic University (TNEU) in Fall 2019 in the Ternopil region of Ukraine. In total, 2,917 primary school children (3rd and 4th grade) from 20 public schools participated in the survey. The schools were selected randomly. The survey was conducted with the permission of the school principals. All children were told that they might refuse to participate in the survey if they did not want to. The child survey was conducted in the classrooms under the supervision of teachers and survey administrators. It contains information on the child's age, gender, number of siblings, household composition, and migration history of fathers/mothers during the survey year. Parents were instructed to complete the survey at home and send it to the school in sealed envelopes prepared by the survey administrators. The parental survey contains information on mothers' and fathers' self-reported levels of education and the migration history of the head of the household. However, the parental survey response rate was very low, particularly for questions related to migration. Thus, we use only the child survey information in the main analysis and data from the parental survey for robustness checks.

In addition to the survey, we conduct a dynamic incentivized real-effort experiment, similar to that designed by Alan et al. (2019), to elicit children's choice between a challenging high-reward and an easy low-reward task in response to the setback. This dynamic response to a setback is the core aspect of perseverance³ and is the main outcome variable of interest. The incentivized real-effort task used in this study consists of 4 rounds. During each of the rounds, children are presented with a grid of numbers from 1 to 99 and are instructed to find

³See Alan et al. (2019) for further discussion.

at least three pairs of numbers that add up to 100 in 1.5 minutes⁴. There are two different types of grid: (1) the “Hard grid” contains 15 pairs of numbers where only 4 of them add up to 100, and (2) the “Easy grid” contains only six pairs of numbers, 4 of which add up to 100. Though the “Hard grid” is more difficult compared to the “Easy grid”, it yields to higher reward in the case of success⁵. Starting from the second round, children are asked to choose between “Hard” and “Easy” grids before each round starts. All children are assigned to a “Hard” grid in the first round. Before the beginning of the experiment, instructors solved the tasks on the blackboard with students to ensure that everyone understood the task and the consequences of "Hard grid" and "Easy grid" choices. At the end of the experiment, one of the rounds is selected randomly, and children are rewarded based on their performance in that round.

Table 1.1 presents descriptive statistics of the main variables of our sample. The sample is gender-balanced – half of the surveyed children are boys. Approximately 24 percent of children succeed in the Hard task in round one, and 45 percent of the students chose the Hard task after failing in round one. Around 28 percent of children chose the Hard task in all rounds. Overall, children’s responses to negative performance feedback in our data are very similar to those reported in Alan et al. (2019). The average household includes around 2.4 adult members, and 24 percent of children are from single-child households. One of three children in our sample reported that their father was a circular migrant in the survey year, and 58 percent of fathers who have been circular migrants have already returned home by the time of the survey. Since less than 2 percent of children reported that their mother was working abroad, we concentrate only on paternal circular migration. We also exclude children from single-mother households from our analysis to control for the confounding effects of a father’s death or divorce.

⁴The incentivized real effort task used in this study is a simplified version of that designed by Alan et al. (2019) to measure the grit of primary school children in Turkey.

⁵Failure yields zero rewards in both types of the grid.

Table 1.1: **Summary Statistics**

Variables	Obs. (1)	Mean (2)	Std.Dev. (3)	Min (4)	Max (5)
Circular migrant father in 2019	2917	0.3215	0.4671	0	1
Mother was working abroad in 2019	2917	0.0150	0.1219	0	1
Father was at home during the survey	938	0.5724	0.4949	0	1
Single mother household	2917	0.0171	0.1298	0	1
Child is a boy	2917	0.5073	0.5003	0	1
Child's age	2917	8.7946	0.6948	8	10
Single child household	2917	0.2458	0.4306	0	1
Number of adults in the household	2917	2.4137	0.7387	1	4
Success in the 1st round	2917	0.2458	0.4306	0	1
Choosing Hard task in the 2nd round after failure in the 1st round:					
All students	2200	0.4554	0.4981	0	1
Children from non-migrant parent households	1458	0.4938	0.5001	0	1
Children from households whose parents migrated in 2019, excluding children whose parents are still working abroad	424	0.4080	0.4920	0	1
Children from households whose parents are still working abroad	317	0.3438	0.4757	0	1
Choosing Hard task in all rounds	2917	0.2852	0.4515	0	1

Note: This table shows the summary statistics of the main variables of our sample. The number of adults in the household includes all adults, except for adult siblings, who live in the same house with a child. The child's perseverance skills, defined as a dummy variable equal to one if a child chooses the Hard task after failing in round one.

1.3 Empirical Strategy

A fundamental problem in identifying the effects of the father's current absence due to circular migration is that the circular migration decision of fathers is likely to be endogenous with respect to children's socio-emotional skills. Furthermore, the empirical estimation of the causal effects of parental absence due to circular migration is complicated by the potentially offsetting effects of fathers' absences and an increase in household income due to remittances. Children from circular migrant families might benefit from the increase in financial inputs due to remittances while suffering emotionally from decreased parental time inputs and involvement in the education process associated with separation from one or

both of the parents. Much of the previous studies have relied on measures of historical or contemporaneous community migration networks and economic conditions in the receiving communities, such as wage rates and unemployment, as instruments for parental absence due to migration and remittances, respectively (Cuecuecha, 2009; Davis & Brazil, 2016). However, historical migration rates and economic conditions in destination countries may affect children in origin communities directly. For example, if the economic conditions in origin and destination countries are correlated or if historical migration rates affect current levels of origin community development (Antman, 2011b).

Other studies compare children from remittance-receiving households without migrant parents abroad to those with migrant parents abroad to separate the effect of remittances from the effect of parental absence (Amuedo-Dorantes, Georges, & Pozo, 2010; Amuedo-Dorantes & Pozo, 2010)⁶. This approach relies on the assumption that the effect of remittances is homogeneous for children from migrant and non-migrant households. However, the presence of both parents may amplify the positive effect of remittances leading to biased estimation results. More related to this study, Antman (2011a) addresses the endogeneity of out-migration decisions by comparing the households in which the heads are still working abroad with those whose heads have recently returned. As discussed in detail in Antman (2011a) and Antman (2015), focusing on households with recent migration experience can eliminate the bias associated with the endogeneity of migration decisions. Furthermore, this strategy also allows identifying the effect of parental absence net of the effects of remittances since the effects of remittances are likely to be the same for children whose fathers are also circular migrants but have recently returned home.

The identification strategy used in this paper is similar to that used by Antman (2011a). However, to address the issue of the endogeneity of return migration, it also takes advantage of the quasi-experimental variation in the duration of circular migration induced

⁶Amuedo-Dorantes et al. (2010) also uses wages and unemployment in destination communities as an instrument for remittances.

by bilateral migration laws between Ukraine and Poland. Specifically, we focus on the circular migrant workers from the Ternopil region in western Ukraine, whose primary destination is Poland. Short-term migrant workers from Ukraine cannot stay in Poland longer than nine months in a calendar year. This restriction in the duration of circular migration creates quasi-experimental variation in the timing of return migration, reducing the bias associated with the endogeneity of the return migration decision. It is important to note that because I compare children whose fathers were at home during the time of the survey with those whose fathers were still working abroad, this strategy identifies only the temporary effect of current paternal absence due to circular migration.

Formally, the effect of the current absence of fathers due to circular migration on the perseverance skills of their children can be identified from the following reduced-form linear regression model:

$$Perseverance_{ijs} = \alpha_0 + \alpha_1 CurrentMigr_i + X_i\theta + \mu_j + \varepsilon_{ijs} \quad (1.1)$$

where $Perseverance_i$ is the perseverance skill score of children i in school s and classroom j . $CurrentMigr_i$ is an indicator variable for whether the household head was present at home when the survey was conducted. X_i is a vector of covariates and includes the number of adults living in the household, children's age, gender and number of siblings. The empirical model also comprises classroom fixed effects μ_j , to account for unobserved time-invariant differences in classrooms, which are likely to be correlated with both circular migration decisions and the perseverance skills of children. The main coefficient of interest is α_1 , which shows the effect of the current absence of fathers due to circular migration on the perseverance skills of their children, net of the effects of self-selection into circular migration and remittances, which should be the same for children whose fathers are also circular migrants but have returned home during the time of the survey.

The type of identification strategy acknowledges that children whose fathers are

circular migrants may differ in unobservable ways from children whose fathers are not circular migrants. However, comparing children whose fathers have all had recent circular migration experience eliminates this problem. An additional challenge is that the return migration decision of fathers may also be endogenous with respect to their children’s perseverance skills. For example, circular migrant fathers who were still working abroad at the time of the survey (treatment group) may sort into different occupations than those who have already returned by the time of the survey (control group). If the unobserved parental attributes that affect the sorting into different occupations are also correlated with the perseverance skill of their children, then the OLS estimate of α_1 from Equation 1 will be biased.

However, this is not likely to be an issue in this particular case because bilateral migration laws between Ukraine and Poland tightly regulate the duration of circular migration. Specifically, short-term migrant workers from Ukraine cannot stay in Poland longer than nine months in a calendar year. This restriction in the duration of circular migration creates quasi-experimental variation in the timing of return migration and reduces the potential bias associated with the endogeneity of the return migration decision. Nevertheless, in the robustness section, I conduct a number of robustness checks and show that our main estimation results are not likely to be driven by the endogeneity of return migration decision.

1.4 Results and Robustness Checks

1.4.1 Results

This section provides empirical results from estimating Equation 1 and conducts robustness checks. Table 1.2 provides OLS estimates of the impact of the current absence of fathers due to circular migration on one of the core aspects of children’s perseverance skills—the choice between a challenging high-reward and an easy low-reward task in response to the setback. Column 1 presents the results from estimating Equation 1 using OLS when perseverance to setbacks, defined as an indicator variable equal to one if the child chooses a

challenging high reward task in round two after failing in round one, is used as a dependent variable. The coefficient on the father’s current location is negative and statistically significant at 5 percent. The estimation results from Column 1 suggest that compared to children whose fathers have recently returned home by the time of the experiment, children whose fathers are still working abroad are approximately eight percentage points less likely to choose challenging high-reward tasks after receiving negative performance feedback.

This is a sizable effect since the probability of choosing a challenging high-reward task after failure is approximately forty percent for students in the control group. Additionally, I find that the negative effect of father’s current absence due to circular migration is mainly driven by a decrease in the perseverance skills of boys; the effect on girls is small and not statistically significant (Columns 2 and 3, respectively). These results are consistent with findings of the previous literature that suggest that the negative effects of father absence due to migration are stronger for boys than for girls (Antman, 2011a, 2011b)⁷. Results presented in Table 1.2 are not sensitive to different model specifications. In particular, I find similar results when I use data from the parental survey and control for the education of mothers (Table A1.2). Overall, these findings strongly support the hypothesis that current paternal absence due to circular migration negatively affects the perseverance skills of children left behind.

In Table A1.3 in the appendix, I also show the estimation results without controls, with only classroom fixed effects, and with classroom fixed effects and controls, to assess the magnitude of the potential attenuation bias discussed in the previous section. The estimated results without controls (Column 1) and with classroom fixed effects (Column 2) are smaller than the estimation results when we use the full set of control variables (Column 3). This suggests that the results presented in Table 1.2 might indeed suffer from a moderate attenuation bias.

⁷However, given that the effect on girls is still large, we cannot reject the hypothesis that the current absence of father due to circular migration affects boys and girls similarly.

Table 1.2: **The Effect of Circular Migration on the Perseverance Skills of Children**

Choosing hard task in round 2 after failing in round 1	All students (1)	Boys (2)	Girls (3)
Father currently abroad	-0.0807*** (0.0152)	-0.0884** (0.0425)	-0.0534 (0.0394)
Control mean	0.4048	0.4174	0.3921
Controls	Yes	Yes	Yes
Classroom FE	Yes	Yes	Yes
Observations	710	367	343

Notes: This table presents the results from estimating Equations 1.1 using data from the child survey. Reported results are obtained via OLS regression. The dependent variable is the perseverance to setbacks, defined as an indicator variable equals to one if a child chooses a challenging high-reward task in round two after failing in round one. Estimates are obtained for children who failed in round one. Controls include the child's gender, grade, number of siblings, and number of adults currently living in the same house. Control means refer to the unconditional mean perseverance skills of children whose fathers have returned home by the time of the survey. The estimates include classroom fixed effects. Standard errors are clustered at the school level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

It is important to note that because I compare children whose fathers were at home during the time of the survey with those whose fathers were still working abroad, this strategy identifies only the temporary (short-term) effect of current paternal absence due to circular migration. Therefore, it is possible that the observed effect of paternal absence is transitory and may disappear when a father returns home. However, understanding the temporary effect of current parental absence is essential because skill formation is a dynamic process, and even temporary but repetitive shocks may have crucial long-term consequences for child development (Evans, 2004; Macours & Vakis, 2010).

1.4.2 Robustness Checks

As discussed in Section 1.2, it is possible that fathers' return migration decision may be endogenous with respect to their children's perseverance skills. For example, it is possible that circular migrant fathers who were absent at the time of the survey sort into different occupations in the destination country than those who have already returned by the time of the survey. If the unobserved parental attributes that affect the sorting into different

occupations also correlate with the perseverance skills of their children, then the results presented in Table 1.2 are likely to be affected by omitted variable bias. To test whether this is an issue in this particular setting, I conduct a number of robustness checks.

First, I conduct a balance test to check whether households in the control and treatment groups differ in terms of their pre-treatment characteristics, such as education of fathers/mothers, household composition, child's gender, and age. I find that the samples are balanced on the education of fathers/mothers, child's gender, and age, but not balanced on the number of children in the household (Table A1.1). However, I failed to reject the null hypothesis that all these variables are jointly balanced. This provides suggestive evidence that even if fathers in the control and treatment groups sort into different occupations, it does not seem to be related to factors that may also predict the perseverance skills of their children. Nevertheless, in the final specification, I condition on child's age, gender, and number of children in the household to control for any effect of the difference in the number of children in the household. Additionally, in Figure A1.1 I show the distribution of propensity scores for children whose parents have never migrated, have recently migrated, and those who are currently working abroad. Propensity scores tend to be higher in the never-migrant compared to the recent migrant and current migrant groups. However, the recent and current migrant groups have similar distributions of propensity scores.

Second, I use the across-school variation in the dates the survey was conducted to test whether the effect of current paternal absence differs for children surveyed at the beginning of October compared to those surveyed later. The sequence in which schools participated in the survey depended on logistical convenience and is not likely to be related to factors that may affect fathers' occupational decisions in the case of circular migration. The idea is that if the return migration date is correlated with the migrant's occupation choice and affects the perseverance skills of children, then the estimated effect of paternal absence due to circular migration should be different in those two samples. Estimation results provided in Table 1.3, Column 1 show that the date when the particular school was surveyed does not

affect the perseverance skills of children, suggesting that the endogeneity of return migration is not likely to be an issue here.

Table 1.3: **Robustness checks**

Variables	Choosing hard task in round 2	Success in round 1		
	after failure in round 1	All students	Boys	Girls
	(1)	(2)	(3)	(4)
Father currently abroad	-0.0829*** (0.0151)	0.0012 (0.0321)	-0.0095 (0.0521)	0.0434 (0.0461)
Treated Early	0.0146 (0.0581)	-	-	-
Controls	Yes	Yes	Yes	Yes
Classroom FE	Yes	Yes	Yes	Yes
Observations	710	896	460	436

Notes: This table presents the results from the robustness check analyses discussed in section 1.3 using data from child survey. Reported results are obtained via OLS regression. Variable “Treated Early” is defined as an interaction between an indicator variable equal to one if a school was surveyed at the beginning of October and the main treatment variable - a dummy variable equal to one if a father is still working abroad. In Column 1, the outcome variable is the perseverance to setbacks, defined as an indicator variable equal to one if a child chooses a challenging high-reward task in round two after failing in round one. In Columns 2-4, the outcome variable is an indicator variable equal to one if a child succeeds in the Hard task in round one. Controls include the child’s gender, grade, number of siblings, and number of adults currently living in the same house. The estimates include classroom fixed effects. Standard errors are clustered at the school level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Third, I test whether children whose fathers are still working abroad are more likely to fail in the first round of the experiment. The idea behind this test is that if children whose fathers have already returned home by the time of the survey differ in terms of their observed or unobserved characteristics from children whose fathers are still working abroad, then this difference is likely to be reflected in their performance in the first round. Furthermore, current paternal absence due to circular migration should not directly affect cognitive skills since they are less malleable than socio-emotional skills. Because all children are assigned to the Hard task in round one, I can directly test this hypothesis. Estimation results provided in Table 1.3, Columns 2, 3 and 4 show that children from both treatment and control groups are equally likely to fail in round one. This suggests that the differences in perseverance

skills observed between treated and control children are not driven by their task-specific skills and further eliminates the concerns related to the endogeneity of the timing of the return migration decision of fathers.

1.5 Conclusion

Using plausibly exogenous variation in the timing of return migration induced by bilateral migration laws between Ukraine and Poland, this study estimates the effect of fathers' current absence due to circular migration on the perseverance skills of children left behind. Overall, the findings of this study support the hypothesis that current paternal absence due to circular migration negatively affects one of the core aspects of children's perseverance skills –the choice between a challenging high-reward and an easy low-reward task in response to the setback. Specifically, I find that children whose fathers are still working abroad are approximately eight percentage points less likely to choose challenging high-reward tasks after receiving negative performance feedback than children whose fathers have recently returned home by the time of the experiment. This effect is sizable since the probability of choosing a challenging high-reward task after failure is approximately forty percent for students in the control group. These findings are not explained by differences in task-specific skills and are robust to the inclusion of school and classroom fixed effects and different model specifications. Therefore, differential sorting of children from circular migrant households across schools and classrooms does not drive the results.

The findings of this study have two main implications. First, the harmful effects of temporary parental absence due to migration extend beyond grade progression and time devoted to educational activities and have a negative effect on socio-emotional skills of children from circular migrant families. Socio-emotional skills significantly affect children's success and human capital formation. Therefore, studies that exclusively rely on achievement tests or school enrolment as a measure of a child's human capital development are likely to

underestimate the overall effect of temporary parental absence due to migration. Second, this study provides empirical evidence suggesting that circular migration is not necessarily a “triple-win” solution that benefits all involved parties. It can generate unintended consequences for the development of the socio-emotional skills of children left behind if not combined with complementary initiatives aimed at providing high-quality schooling in origin countries.

Appendix

Figure A1.1: Distribution of Propensity Scores

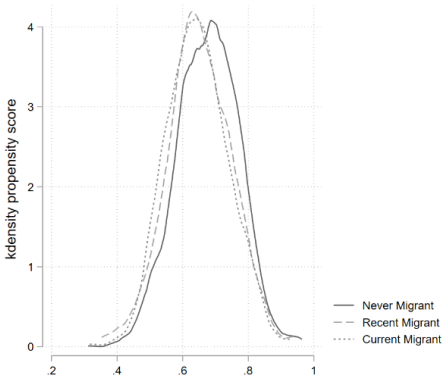


Table A1.1: **Balance Test**

Variables	Control group (1)	Treatment group (2)	P-value (3)
Panel A: Balance test results from Child survey			
Child's age	8.707	8.770	0.2039
Child is a boy	0.502	0.536	0.3680
Number of adults in the household	2.468	2.493	0.6551
Number of children in the household	1.814	1.726	0.0497**
Sample size	410	300	
Joint orthogonality test p-value			0.2285
Panel B: Balance test results from Parental survey			
Father's education	0.390	0.371	0.6865
Mother's education	0.601	0.590	0.8108
Sample size	256	183	
Joint orthogonality test p-value			0.5412

Notes: Panel A provides results from the balance test based on Child survey data. Panel B provides results from the balance test based on Parental survey data. Column 1 presents the means of selected variables for households in which the father has already returned home (control group). Column 2 presents the means of selected variables for households in which the father was still working abroad (treatment group). Column 3 provides test p-value for the difference in means between the control and treatment groups. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A1.2: **The Effect of Circular Migration on the Perseverance Skills of Children: Parental Survey**

Choosing hard task in round 2 after failure in round 1	All students (1)	Boys (2)	Girls (3)
Father currently abroad	-0.0704** (0.0319)	-0.0896* (0.0459)	-0.0959 (0.0662)
Control mean	0.3867	0.4000	0.3719
Controls	Yes	Yes	Yes
Classroom FE	Yes	Yes	Yes
Observations	439	229	210

Notes: This table presents the results from estimating Equations 1.1 using data from only the sample of children whose parents responded to the survey. Results are obtained via OLS regression. The dependent variable is the perseverance to setbacks, defined as an indicator variable equal to one if a child chooses a challenging high-reward task in round two after failing in round one. Controls include the child's gender, grade, number of siblings, and number of adults currently living in the same house. Control means refer to the unconditional mean perseverance skills of children whose fathers have returned home by the time of the survey. The estimates include classroom fixed effects. Standard errors are clustered at the school level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A1.3: **Robustness Check**

Choosing hard task in round 2 after failure in round 1	All students (1)	All students (2)	All students (3)
Father currently abroad	-0.058*** (0.012)	-0.073*** (0.017)	-0.081*** (0.014)
Controls	No	No	Yes
Classroom FE	No	Yes	Yes
Observations	710	710	710
R^2	0.004	0.151	0.154

This table presents the results from estimating Equations 1.1 using data from the child survey. Reported results are obtained via OLS regression. The dependent variable is the perseverance to setbacks, defined as an indicator variable equals to one if a child chooses a challenging high-reward task in round two after failing in round one. Estimates are obtained for children who failed in round one. Controls include the child's gender, grade, number of siblings, and number of adults currently living in the same house. Standard errors are clustered at the school level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

2 Chapter

Migration Opportunities and Human Capital Investment Decisions: Evidence from Ukraine

Abstract

This paper examines the impact of international migration opportunities on origin-country skills composition by exploiting changes in migration opportunities induced by visa liberalization between EU countries and Ukraine. We use individual-level data from the universe of centralized test results and subject choices from end-of-high-school exams held from 2016 to 2019 in Ukraine. We exploit regional variation in aspirations to migrate to EU countries prior to the introduction of the visa liberalization policy and rely on the Difference in Difference approach to identify the causal effects of the policy. Our results suggest that greater opportunities to emigrate to EU countries increased the probability students will choose subjects that are more likely to lead to internationally transferable skills in Ukraine. We find no evidence that greater opportunities to emigrate to the EU significantly affect student performance or the probability of failing exams in subjects that are likely to lead to more internationally transferable skills. This suggests that the observed increase in the share of students choosing more internationally transferable subjects was not accompanied by a decrease in student performance or in the competitiveness of the study programs.

JEL codes: J24, F22, O15

Keywords: Migration opportunities, Human capital, Student performance

2.1 Introduction

Migration opportunities are growing globally. International migration is usually associated with increases in income and overall well-being for both migrants and for their family members left behind (Yang, 2008). However, the overall effects of migration on human capital formation in origin countries are ambiguous in theory. On the one hand, an increase in migration may lead to human capital depletion and brain drain in origin countries. On the other hand, migration may increase human capital investments in origin countries through greater returns to education and skills abroad (Beine, Docquier, & Rapoport, 2008; Docquier & Rapoport, 2012; Mota Aquino, 2023; Shrestha, 2017)⁸. Notably, a few recent studies (Abarcar & Theoharides, 2021; Khanna & Morales, 2017) have provided evidence that the introduction of migration opportunities for highly specialized occupations increases enrollment in education for those fields. However, relatively little is known about the effects of an increase in ex-ante skill-unbiased migration opportunities on the composition of skills acquired in the country of origin, which may have crucial consequences for avoiding labor shortages in origin countries and for adjusting labor markets in destination countries.

This paper examines the impact of international migration opportunities on skills composition in the origin country. We study how an increase in migration opportunities related to a visa liberalization policy between EU countries and Ukraine affects investments in the origin country-specific and internationally transferable skills of Ukrainian high-school graduates. We use individual-level data from the universe of the high-school student subject choice for Independent External Tests (IET) held from 2016 to 2019 in Ukraine to measure origin country-specific and internationally transferable skills. IET exams are standardized high-stake exams that have the same status as university entrance exams. Therefore, focusing on the student subject choice on IET exams also allows us to shed light on the impacts of migration opportunities on the tertiary education decisions of students and their parents.

⁸Mota Aquino (2023) showed that returns to the Mexican education of children of migrants are lower in the U.S. than non-migrants.

Ukraine provides an excellent setting to explore the effects of migration opportunities on the skills composition of those who remain in the country. First, Ukraine is one of the top source countries for labor migrants to the EU-27 countries. Labor migrants from Ukraine accounted for approximately two-thirds of total labor migrants in the EU in 2016. Therefore, understanding changes in the composition of future potential labor migrants from Ukraine is of great importance for policy makers. Second, abolishment of the visa obligation in June 2017 for Ukrainian citizens who hold a biometric passport and want to travel to EU countries significantly increases their migration opportunities. Since the introduction of visa liberalization between EU states and Ukraine, migration from Ukraine has increased from 486,722 in 2016 to 659,609 in 2019 (approximately a 35 percent increase).

We exploit the variation across regions of Ukraine in exposure to the 2017 EU visa liberalization policy induced by the past emigration aspirations to EU states, to identify the causal effect of the increase in migration opportunities. If the policy successfully influences decisions related to human capital investment, it is anticipated that areas with a higher proportion of individuals aspiring to migrate to EU countries will experience a more significant rise in selecting internationally transferable subjects. To see this, consider regions A and B. Assume that the share of the population with unrealized aspirations to migrate is 20 and 10 percent in regions A and B, respectively. Under the condition that these individuals are weakly more likely to respond positively to the increase in migration opportunities, a higher share of the population in region A will respond to the policy change compared to region B. We exploit this heterogeneity in exposure to the visa-free regime across regions of Ukraine and use a difference-in-differences (DID) estimation strategy to obtain a causal estimate of the effect of the EU visa-free policy on student's choice of subjects.

We find that greater opportunities to emigrate to EU states increased the probability that students will choose subjects that are likely to lead to more internationally transferable skills, such as math. Students tended to switch from more origin country-specific subjects, such as Ukrainian history, increasing the human capital stock of internationally more transferable

skills and decreasing the stock of country-specific skills in the origin country. We find no evidence that there was a decline in the quality of students choosing internationally transferable subjects, either in terms of standardized performance in IET exams or the probability of failing the exam. Our findings suggest that international migration opportunities can change the overall skill structure of the origin country, resulting in less investment in origin-country-specific skills, even if the primary effects of migration opportunities on human capital investment are positive. Furthermore, our findings highlight the importance of looking beyond the extensive margin decision to enroll in higher education and estimating the elasticity of overall education to migration opportunities.

This study builds upon the literature on the effects of migration opportunities on human capital formation in origin countries. Most previous studies explore the elasticity of overall education level to changes in international migration opportunities (Batista, Lacuesta, & Vicente, 2012; De Brauw & Giles, 2017; Dinkelman & Mariotti, 2016; Saad & Fallah, 2020; Shrestha, 2017; Theoharides, 2018). However, migration opportunities can also impact the returns to occupations and skills that are more internationally transferable relative to those that are more origin-country-specific, changing the overall skill structure of the origin country.

Most closely related to this paper, two recent studies (Abarcar & Theoharides, 2021; Khanna & Morales, 2017) provide evidence of the effects of occupation-specific migration policies on skill composition within one field of study (the IT sector in the case of Khanna and Morales (2017), and nursing in the case of Abarcar and Theoharides (2021)). In contrast to these studies, we examine the effects of a countrywide skill-unbiased migration policy, and focus on high-school student's choices of origin-country-specific versus internationally more transferable skills. This paper is also related to the recent study by Chand and Clemens (2019), which shows that individuals invest more in mobile human capital and education when they face higher probabilities of emigration because of discrimination. Though the exact mechanisms behind increased investment in mobile human capital are different in this study, the results point in the same direction – increased migration prospects, either voluntary or

due to discrimination, increase investment in mobile human capital.

Understanding the implications of skill-unbiased migration policies on human capital investment decisions in the source country is essential for policymakers in potential destination countries as they seek to predict the skill composition of potential migrants who, in the future, may become part of their labor force. Furthermore, it can help policymakers in the origin country to better understand the future skill composition of the domestic labor force.

The remainder of this paper is organized as follows. Section 2 briefly describes the Ukrainian school system and institutional setting, and overviews the data we use for the empirical analysis. Section 3 discusses empirical specification and identification assumptions, followed by the baseline results and robustness checks in Section 4. Section 5 concludes.

2.2 Institutional Setting and Data

2.2.1 Education System in Ukraine

The Ukrainian school system is organized into three levels: primary, lower basic secondary, and upper basic secondary education. Education is compulsory through the end of general secondary school. Since 2018, this means 12 years instead of the previous 11, except for students who completed grade 1 prior to 2018 (still 11 years). The primary school is four years, and lower basic secondary school is five years. There is no early division of children into different school types after the fourth grade, as in some European countries. After passing final exams in the ninth grade, pupils receive a lower basic secondary school certificate, which gives them access to secondary level II (general high school) or, alternatively, to vocational training.

At the end of high school (or equivalent), students take centralized Independent External Tests (IET) in several subjects, which are graded using a criterion-referenced grading system. The results of the IET tests have the same status as university entrance

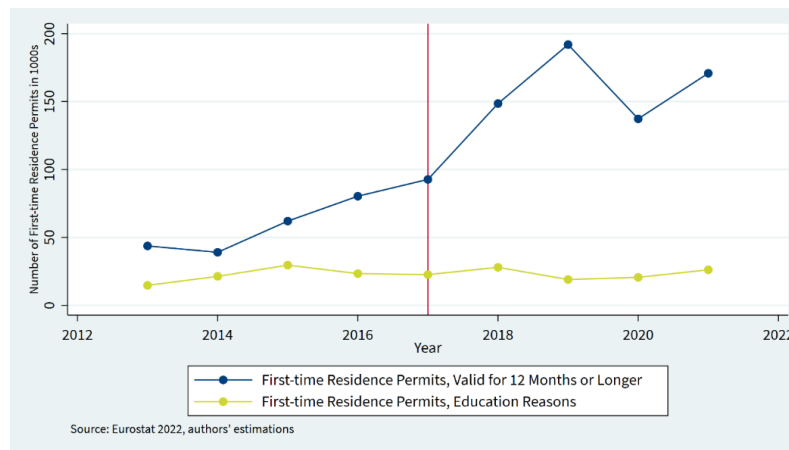
exams and are a prerequisite for students to enter a university. They are high stakes exams, and students (and their parents) spend considerable financial and time resources to prepare to pass the tests. A test in Ukrainian language and literature is mandatory for all students who wish to enter a university regardless of their choice of major, and some university majors require students to take tests in specific subjects. Therefore, student's choice of IET subjects is predictive of their choice of major.

IET subjects that lead to more internationally transferable university majors, such as STEM subjects, are likely to be more valued abroad than subjects such as Ukrainian history and literature, which lead to more origin country-specific majors. Hence, the choice of IET subjects has important consequences for the future opportunities of students in both Ukrainian and foreign labor markets. The introduction of a visa-free regime and the resulting increase in migration opportunities can influence the potential returns to IET subjects that signal more internationally transferable skills relative to those that signal more origin-country-specific skills, changing the overall skill structure of the origin country. The IET subject choices of high school students allow us to differentiate between origin country-specific and internationally transferable human capital investments and, hence, are better fitted to measure the overall effect of migration opportunities on the human capital investment decisions of the next generation than alternative measures such as educational expenditure on children or school enrollment.

2.2.2 Emigration from Ukraine

The European Union is the top destination for immigrants from Ukraine. According to Eurostat data, approximately 873,372 Ukrainian citizens received first-time residence permits in the EU 27 states in 2021. Approximately 88 percent of those residence permits were issued for remunerated activities. In June 2017, the EU abolished the visa obligation for citizens of Ukraine who hold a biometric passport and who want to travel to EU countries (excluding countries outside of the Schengen zone) for 90 days within 180 days.

Figure 2.1: **First-time Residence Permits Issued by EU-27 Member States to Citizens of Ukraine**



After the introduction of visa liberalization between EU states and Ukraine, migration from Ukraine increased from 486,722 in 2016 to 659,609 in 2019 (approximately a 35 percent increase). In parallel, the number of residence permits valid for 12 months or longer, which are mostly issued for higher-ranking positions (Dubenko & Kravchuk, 2021), also increased sharply after the introduction of the visa liberalization policy (Figure 2.1). In contrast, the number of first-time residence permits issued for the purpose of education was relatively stable before and after the introduction of the visa liberalization policy, suggesting that the policy was unlikely to affect the probability of Ukrainians seeking education abroad (Figure 2.1).

The visa liberalization policy did not allow Ukrainian citizens to work in EU member states without first obtaining a valid work permit. However, it made it easier for Ukrainians to move to EU countries to search for a job, potentially reducing job search and signaling costs. Additionally, the visa liberalization policy may have increased labor migration from Ukraine by reducing the screening costs for foreign employers to assess the quality of a candidate.

2.2.3 Data and Descriptive Statistics

The primary data we use is from the *Ukrainian Center for Evaluation of the Quality of Education* (n.d.). The data consists of individual IET test results and subject choices from the universe of exams held from 2016 to 2019 in Ukraine from 3,903 schools. The data additionally contains information about student sex, year of birth, school address, and school type. Such data is hard to obtain in most developing countries, and the availability of this data is one of the primary reasons we focus on Ukraine. Table 2.1 presents descriptive statistics of the main variables of our sample.

Table 2.1: **Summary Statistics**

Variables	Mean (1)	Std.Dev. (2)	Min (3)	Max (4)
Take Ukrainian history	0.721	0.448	0	1
Take math	0.504	0.499	0	1
Ukrainian history test score	125.1	48.82	0	200
Math test score	128.2	52.25	0	200
Ukrainian history test score conditional on not failing the test	139.7	24.74	100	200
Math test score conditional on not failing the test	144.7	26.48	100	200
Female	0.531	0.499	0	1
Age	17.34	0.890	15	58
School-Cohort Size	39.41	31.04	1	297
Observations	251,717			

Note: This table shows the summary statistics of the main variables of our sample. The sample excludes data from Crimea, Donetsk and Luhansk, Lviv, Volyn, Zakarpatia, and Chernivtsi regions of Ukraine. Additionally, we restrict the sample to schools that can be followed from 2016 to 2019. Source: Author's calculations based on data from the Ukrainian Center for Evaluation of the Quality of Education (2016-2019).

The main outcome variables of interest in this study are the IET subject choices of high school students. We focus on math and the history of Ukraine. Students who choose math usually enroll in STEM related majors, which are more in demand, especially in EU member states, and which are more easily transferable to other countries in general. In

contrast, students who choose Ukrainian history are more likely to enroll in humanities majors such as law, religious studies, philosophy, and art history, which are more specific to the Ukrainian labor market and are usually less internationally transferable.

On average, approximately 50 percent of students choose math, while 72 percent choose Ukrainian history. Average test scores, excluding failing scores, are approximately 145 and 140 for math and Ukrainian history, respectively. Our sample is gender-balanced – 53 percent of the students are female. In our regression analyses, we restrict the sample to students who were aged 17 and 18 at the time they took the test. The average school cohort size is approximately 40. In the main analyses, we exclude students from schools that had fewer than 25 students (16 percent of the schools), because the data from small schools is noisy.

Additionally, we exploit the Gallup World Poll survey, which is a nationally representative, repeated cross-sectional survey covering around 99 percent of the world’s population from 2010 to 2021. The survey includes information about individual’s attitudes and perceptions such as corruption perception, civic engagement, and community attachment among many others. It also includes questions about the respondents’ migration intentions. The Gallup data was extensively used by the previous studies to investigate the link between migration intentions and actual migration behavior (Docquier, Peri, & Ruysen, 2014; Tjaden, Auer, & Laczko, 2019). Approximately 1,000 people were interviewed annually in Ukraine between 2009 and 2021. Overall, we have information about 10,776 survey respondents from 2009 to 2021, excluding 2020 because of missing information for the desired destination in the survey questions.

In our analyses, we use the following question from the Gallup to measure individuals’ intentions to migrate to EU countries - ‘Ideally, if you had the opportunity, would you like to move permanently to another country, or would you prefer to continue living in this country?’. Respondents who positively answered this question were also asked to specify the preferred destination country. This question is well fitted for the purpose of this study because it

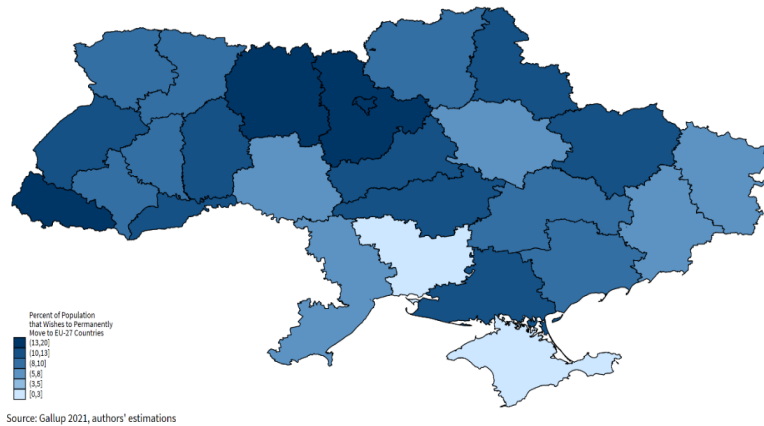
reveals individuals who would “prefer” to migrate but currently do not have an opportunity to realize their migration aspirations. Intuitively, one would expect the effect of an increase in migration opportunities to be more pronounced among individuals who aspire or intend to migrate compared to those who prefer to stay in their origin country.

We then aggregate the data at the regional level to obtain the regional shares of the population that aspires to migrate to EU countries. When we break down the annual data across regions, the data becomes noisy. Therefore, we are not able to exploit the variation over time within a region in the aspiration to migrate to EU states after the introduction of the visa liberalization policy. To overcome this issue, we pool the data from all waves of the Gallup survey to decrease the noise. In our analyses, we include the aspirations of all surveyed individuals regardless of their age, because parents may influence student’s choice of the IET subjects.

Ukrainian regions differed in terms of resident’s aspirations to migrate to EU countries prior to visa liberalization (Figure 2.2). Previous studies suggest that there is a strong positive association between migration aspirations and intentions and actual migration behavior (Docquier et al., 2014; Tjaden et al., 2019). Therefore, regions with a larger share of the population who aspired to migrate to EU countries prior to the policy change would be more affected than regions with a smaller share. We exploit this heterogeneity in exposure to the visa liberalization policy across regions of Ukraine to obtain a causal estimate of the effect of the policy on student’s IET subject choices.

Consider two hypothetical regions in Ukraine - A and B, and assume that the share of the population that aspires to migrate to EU states is higher in A than in B. Under the assumption that individuals who aspire to migrate are weakly more likely to respond positively to an increase in migration opportunities, a higher share of the population in region A will respond to the policy change. One could also imagine the opposite scenario, in which regions with a larger share of the population who aspired to migrate to EU countries before the policy change are less affected than regions with a smaller share of the population who

Figure 2.2: **Percent of the Population that Wished to Permanently Move to EU-27 Countries before the Introduction of the Visa Liberalization Policy**



aspired to migrate to EU states. This scenario is possible if, for example, people in region A have already invested a lot in activities that allow them to overcome visa hurdles, so they may be less affected by the visa liberalization policy. However, if this were the case, the estimated relationship of interest would have a bias towards a negative effect of EU visa liberalization on the choice of internationally more transferable skills. Instead, in our results section, we show that the effect is positive, suggesting that this alternative scenario is unlikely to be true.

There are 24 regions and the Autonomous Republic of Crimea in Ukraine. All regions were included in the visa liberalization policy. However, we exclude the Crimea, Donetsk, and Luhansk regions from our analyses because, after Russia occupied most parts of these regions, the majority of Ukrainians living in those regions were either forced to flee or to accept Russian citizenship, so their access to international migration was restricted. Additionally, we exclude regions bordering EU countries, because those regions were exposed to several other policies⁹ that allowed migration from Ukraine and, therefore, could not serve as a valid control or treatment group.

Figure A2.2 in the appendix presents the distribution of the tests taken before and

⁹Citizens of Ukraine living close to the border between Ukraine and EU countries were allowed to move to bordering EU countries for a short period of time without first obtaining a visa.

after the visa liberalization in highly exposed (treated) and less exposed (control) regions. Before 2018, the treated and control regions were similar in terms of the average probability of a student would choose to take a math exam. However, after the policy, the increase in the percent of students who chose to take the IET math exam increased by much more in the treated than in control regions. This provides first suggestive evidence that regions with a population that holds relatively high prior intentions to move to the EU are more affected by the visa liberalization policy than are regions with less.

2.3 Empirical Strategy

The main empirical problem in identifying the effect of the increase in EU migration opportunities for Ukrainians on IET exams choices is that all Ukrainians were exposed to the policy treatment. Comparing the choices of students before and after the policy change requires us to make an unrealistic assumption that there are no underlying time-dependent trends in the choices of IET exam subjects that are unrelated to the introduction of the visa-free regime. To overcome this issue, we exploit the fact that not all geographic regions of Ukraine were equally affected by the policy.

Intentions and aspirations to migrate to EU countries prior to the introduction of the new policy matter in terms of whether individuals would be affected or not. We exploit this heterogeneity in the exposure to the visa-free regime across regions of Ukraine and use the difference-in-differences (DID) estimation strategy to obtain a causal estimate of the effect of the EU visa-free policy on the student choice of IET subjects. If the policy successfully influences decisions related to human capital investment, it is anticipated that areas with a higher proportion of individuals aspiring to migrate to EU countries will experience a more significant rise in selecting internationally transferable subjects. It is important to note that this method does not aim to determine the impact of randomly assigning students to opportunities for migration to EU countries. For instance, if the individuals aspiring to

migrate to the EU are exclusively those who would never choose a specific IET subject, then the policy would not have influenced the selection of IET subjects. In the simplest setting, we can identify this effect from the following linear regression model:

$$Outcome_{ist} = \alpha_0 + \beta_1(Share_r * Post_t) + X_{ist} + \mu_s + \theta_t + \varepsilon_{ijs} \quad (2.1)$$

where i indexes students, s indexes schools and t indexes years. $Outcome_{ist}$ is an indicator variable that equals one if a student chooses to take the IET math exam (Ukrainian history) and zero otherwise, and is the main outcome of interest. We include school μ_s and year θ_t fixed effects to control for time-invariant differences across schools. X_{ist} is a set of control variables and includes student age, gender, school-cohort size, and urban dummy. The main variable of interest is the interaction of $Share$, which represents the percentage of the population at the regional level who intended to migrate to EU countries prior to the policy change and captures the intensity of the policy treatment effect, and $Post$, which is an indicator variable that equals one for the period after the introduction of the visa-free regime and zero otherwise. The pre-and post-treatment periods are 2016, 2017, and 2019, respectively. The coefficient β_1 is the main parameter of interest and shows the differential effect of the policy change for a region with one percentage point higher baseline migration aspirations. We cluster standard errors ε_{ist} at the level of regions to account for the fact that treatment intensity varies across regions rather than individual students.

To better understand the DID estimates, it is helpful to consider an experimental analogy. Let us assume that certain individuals are more inclined to aspire to migrate to EU countries, regardless of their IET subject choices. Now, let us imagine that EU states randomly altered the opportunity to migrate to EU for various regions in Ukraine. Specifically, there is a 'treatment' group of regions where individuals were given an opportunity to migrate to the EU without a visa, while a 'control' group of regions continued with the existing opportunities for migration. In this scenario, we would then compare the subsequent changes

in IET subject choices between the treatment and control regions to estimate the causal effect of the visa liberalization policy.

In our DID setting, migration opportunities changed across regions simultaneously, but we distinguish between 'control' and 'treatment' groups based on the proportion of the region's population aspiring to migrate to the EU in the periods immediately preceding the change. Regions with a relatively small proportion of individuals aspiring to migrate serve as a better approximation for the control group, while regions with a relatively large proportion better represent the treatment group. The treatment effect is identified by examining the relative change in outcomes relative to the size of the pre-existing proportion of the population aspiring to migrate to the EU.

Our DID setting can be also viewed as a reduced form of a general Shift-Share design where the identification is based on the exogeneity of shares (Goldsmith-Pinkham, Sorkin, & Swift, 2020). Pre-existing shares of the population aspiring to migrate to the EU measure the differential exogenous exposure to the common visa liberalization shock. Our reduced-form Shift-Share strategy tests whether differential exposure to common shocks leads to differential changes in the outcome of interest. Note that this empirical strategy can be valid even if the pre-existing shares of the population aspiring to migrate to the EU are correlated with the levels of the outcomes.

The variation exploited by the empirical specification presented above is the uniform shock that hit all individuals when the visa-free policy was introduced (captured by year fixed effects) and the variation across regions in intentions to migrate to EU countries. The identifying assumption to be a valid estimate of the causal effect of the policy change is that, in the absence of the EU migration policy change, the outcome variable of interest in regions with different baseline shares of migration aspirations would have moved in parallel. Differences between regions with high and low migration intention shares are removed by the inclusion of fixed effects. In Appendix Figure A2.1, we provide a graphical test of the plausibility of the parallel trend assumption. There is no evidence of differential trends across

regions with high and low population shares aspiring to move to EU countries.

Additionally, we conduct a battery of other robustness checks to alleviate concerns that the parallel trends assumption might not hold. First, we test whether there is an effect in 2018, immediately after the introduction of visa liberalization. Choosing a specific IET subject is costly; students need time to prepare for the exams, and the choice of the particular subject is likely made at least one year prior to the exam date. Therefore, one would expect no or very small effect of visa liberalization in 2018. In the results section, we confirm that the policy had no significant effect on student choice of IET subjects in 2018. Second, we combine our DID estimation method with a propensity score matching strategy, to make students in the control and treatment groups more comparable in terms of their school characteristics, such as the average age of the school cohort, its gender composition, and size. The results of the estimation of the matched DID model align with the results obtained from estimating in Equation 2.1 using DID strategy, and strengthen the credibility of our main results.

An essential concern when applying the DID approach is addressing potential non-random selection of regions with higher percentages of residents aspiring to migrate to EU countries with respect to students' IET exam choices. The inclusion of fixed effects in Equation 2.1 helps account for time-invariant differences across schools and regions. However, we still need to consider unobserved time-varying differences across regions that may be correlated to both aspirations to migrate to the EU and subsequent IET exam choices. For instance, the comparison across high versus low EU migration aspiration regions may simply reflect other intra-regional differences, such as the degree of poverty, that are driving the observed differential response to visa liberalization. In this case, the observed effect will not be because of differential exposure to migration opportunities but rather due to time-varying unobserved differences across regions that are also correlated with migration intentions.

To mitigate these concerns, we conduct a placebo test where we use prior intentions to move to non-EU countries instead of EU countries as a “fake” measure of exposure to visa liberalization. Because migration opportunities to non-EU countries were unaffected by

the introduction of the visa liberalization policy, one would expect no differential changes in the outcome of interest between regions with high and low intentions to move to non-EU countries. In Table A2.4 in the appendix, we show that this “fake” measure of exposure to the visa liberalization policy had no significant effect on our outcomes of interest, suggesting that the differences across regions that are correlated with intentions to migrate and that might also drive the investment in internationally transferable skills are not likely to drive the estimated results, and further strengthen the credibility of our main results.

2.4 Results and Robustness Checks

This section describes the empirical results from estimating Equation 2.1 and conducts the robustness checks discussed in Section 2.3. Table 2.2 shows DID estimates of the impact of the increase in migration opportunities due to visa liberalization on the student choice of IET exams. Column 1 in Panel A presents the results from estimating Equation 1 when an indicator for choosing math is used as a dependent variable. The results suggest that students from regions with one percentage point higher baseline migration aspiration share have an approximately 0.38 percentage point increase in the probability of choosing math for their IET exams. We scale the results by the magnitude of the inter-decile range of the share of the population with migration aspirations, which is 6.72 percentage points. Moving from the 10th percentile of the migration aspiration share at baseline to the to the 90th percentile equates to $6.72 \times 0.38 \approx 2.5$ percentage points. With the average 50.9 percent probability of choosing math in the pre-period, this is equivalent to approximately a $2.5 \times 100 / 50.9 \approx 4.9$ percent increase.

In terms of origin country-specific subjects, the results in Column 2 of Panel A suggest that students from regions with a one percentage point higher baseline migration aspiration share experienced an approximately 0.37 percentage point decrease in the probability of choosing Ukrainian history in their IET exams. Scaling the results by the magnitude of

the inter-decile range of the share of the population with migration aspirations results in approximately 2.4 percentage points. With the average probability of choosing Ukrainian history of approximately 70 percent in the pre-period, this is equivalent to a 3.5 percent decrease. This decline is relatively modest compared to the observed increase in the probability of choosing math in response to increased migration opportunities. The estimated coefficients are not sensitive to different model specifications. We find similar results when we exclude very large schools from the sample (Panel B, Columns 3 and 4).

Table 2.2: **Migration Opportunities and Subject Choice**

	Panel A		Panel B	
	All School-cohorts		Between 25 to 200 students	
	(1)	(2)	(3)	(4)
	Math	Ukrainian history	Math	Ukrainian history
Interaction	0.00376** (0.00129)	-0.00369** (0.00110)	0.00396*** (0.00138)	-0.00393** (0.00119)
Student is Male	0.215*** (0.00917)	-0.188*** (0.0121)	0.215*** (0.00917)	-0.188*** (0.0121)
Base Year Mean	0.5094	0.7051	0.5082	0.7048
School FE	Yes	Yes	Yes	Yes
Observations	120,913	120,913	120,142	120,142
R^2	0.052	0.048	0.052	0.049

Notes: This table presents the results from estimating Equation 1 using DID regression. The analyses exclude data from the Crimea, Donetsk and Luhansk, Lviv, Volyn, Zakarpattia, and Chernivtsi regions. In all specifications, we restrict the sample to schools that can be followed from 2016 to 2019 and exclude 2018. Columns 1 and 3 present the results from estimating Equation 1 using an indicator for choosing math in IET exams as a dependent variable. Columns 2 and 4 present the results from estimating Equation 1 when we use an indicator for choosing Ukrainian history in IET exams as a dependent variable. In Panel B, we exclude school cohorts with fewer than 25 and more than 200 students. In all specifications, we include only students who were aged 17 and 18 when they took the test. Controls include student sex, age, school-cohort size, and an urban dummy. Base year mean refers to the average probability of choosing math and Ukrainian history before 2018. The estimates include school fixed effects. Bootstrapped (1000 reps.) standard errors are clustered at the region level and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In Appendix Table A2.1, we use a binary indicator for high migration aspiration regions instead of a continuous measure of the share of the population with migration aspirations before the visa liberalization policy was introduced (Table A2.1, Panel A). Additionally, we combine our DID estimation method with a propensity score matching strategy to make

students in the control and treatment regions more comparable in terms of their school characteristics, including age, gender composition, and size of the school cohort (Table A2.1, Panel B). The main difference with the results presented in Panel A of Table A2.1 is that the control group is determined based on propensity scores in Panel B. The results of the estimation of the standard DID specification with binary treatment and matched DID specification are in line with the main results presented in Table 2.2, increasing the credibility of our main results and further alleviating concerns related to the validity of the parallel trend assumption.

Regarding concerns that the parallel trends assumption might not hold, we also test whether the increase in migration opportunities affected student choice of IET exams in 2018, immediately after the introduction of the visa liberalization policy. Last-minute changes of subject choices are costly. As noted, students need time to prepare for IET exams, and usually choose the particular subject at least one or two years prior to the exam date. Therefore, one would expect no or very small effect of the visa liberalization policy in 2018. The results presented in Table 2.3 confirm that the policy had no significant effect on student choice of IET subjects in 2018, further alleviating concerns that the possible violation of the parallel trends assumption drives the observed effect of visa liberalization.

Given the significant increases in the share of students choosing math, one crucial question is whether the performance of students, measured by scores from the math IET exams, declined after the introduction of the visa liberalization policy. The sign of the effect of an increase in migration opportunities on the performance on the math exam is ambiguous. On the one hand, higher potential returns from math skills may motivate students to invest more in math exams - increasing their overall performance in math. On the other hand, more students overall chose math, and if those who chose math because of the increase in migration opportunities are from the lower half of the math skills distribution, the effect of migration opportunities on the overall math exam performance will be negative. Therefore, the overall effect depends on the relative magnitude of these two effects.

Table 2.3: **Effect of Migration Opportunities on Subject Choice in 2018**

	Panel A		Panel B	
	All School-cohorts		Between 25 to 200 students	
	(1)	(2)	(3)	(4)
	Math	Ukrainian history	Math	Ukrainian history
Interaction	0.000468 (0.000459)	-0.00159 (0.00107)	0.000424 (0.000470)	-0.00156 (0.00103)
Student is Male	0.223*** (0.00919)	-0.194*** (0.0121)	0.203*** (0.00919)	-0.168*** (0.0121)
School FE	Yes	Yes	Yes	Yes
Observations	119,904	119,904	118,948	118,948
R^2	0.052	0.047	0.052	0.048

Notes: This table presents the results from estimating Equation 1 using DID regression. The analyses exclude data from the Crimea, Donetsk and Luhansk, Lviv, Volyn, Zakarpattia, and Chernivtsi regions. In all specifications, we restrict the sample to schools that can be followed from 2016 to 2019 and exclude 2018. The pre-and post-treatment periods are 2016 - 2017, and 2018, respectively. Columns 1 and 3 present the results from estimating Equation 1 using an indicator for choosing math in IET exams as a dependent variable. Columns 2 and 4 present the results from estimating Equation 1 when we use an indicator for choosing Ukrainian history as a dependent variable. In Panel B, we exclude school cohorts with fewer than 25 and more than 200 students. In all specifications, we include only students who were aged 17 and 18 at the time of the test. Controls include student sex, age, school-cohort size, and an urban dummy. The estimates include school fixed effects. Bootstrapped (1000 reps.) standard errors are clustered at the region level and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

To test whether the performance of students choosing math declined, we estimate Equation 2.1 using the performance in the math exam scores and the probability of failing the exam as our dependent variables. The results in Table A2.2 in the Appendix provide no evidence that there was a decline, either in terms of standardized performance or in the probability of failing the exam. Furthermore, the estimated effects of an increase in migration opportunities due to visa liberalization are small and statistically insignificant (Table A2.2, Panels A and B). For Ukrainian history, we find no evidence that standardized test scores have declined. However, we find that there was a significant increase in the probability of failing the test (Table A2.3, Panels A and B).

2.5 Conclusion

This study uses administrative data from the Ukrainian Center for Evaluation of the Quality of Education on IET subject choices of Ukrainian high school students, and exploits changes in EU visa policies for citizens of Ukraine to measure the origin-country human capital response to international migration opportunities. Using the variation across regions of Ukraine in exposure to the visa liberalization policy induced by the past emigration aspirations to EU states, we find that greater opportunities to emigrate to EU states increased the probability students will choose subjects that are likely to lead to more internationally transferable skills and decreased the probability of choosing subjects that are more likely to lead origin country-specific skills in Ukraine. We find no evidence that there was a decline in the performance of students choosing internationally more transferable subjects, either in terms of standardized performance in IET exams or in the probability of failing the exam. Overall, our findings suggest that international migration opportunities can change an origin country's future skill structure, resulting in less investment in origin-country-specific skills, even if the overall effect of migration opportunities on human capital investment is positive. Our findings may improve understanding of the implications of skill-unbiased migration policies on human capital investment decisions in the source country, and are important for policymakers in potential destination countries who seek to predict the future skill composition of potential migrants who, one day, may become part of their own labor force. Furthermore, the results can also help policymakers in the source country to understand better the future skill composition of their domestic labor force

Appendix

Figure A2.1: Graphical Test for Parallel Trends

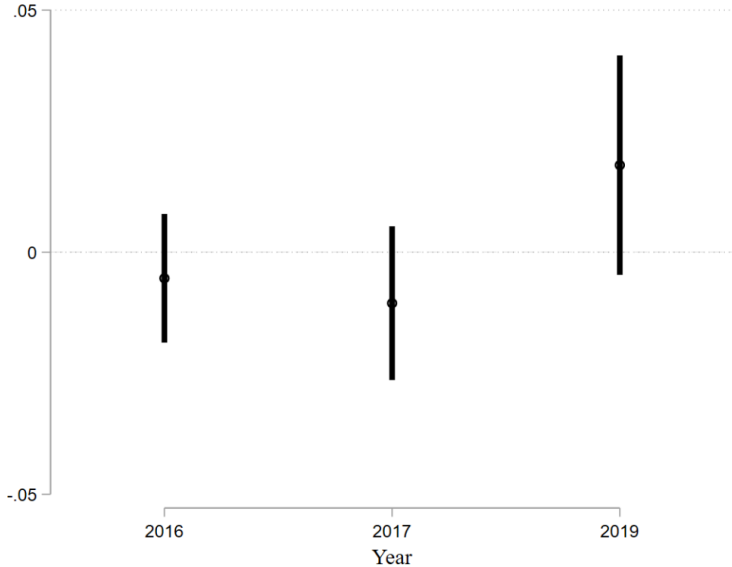


Figure A2.2: Distribution of IET Tests Between Treated and Control Regions Before and After the Introduction of the Visa Liberalization Policy

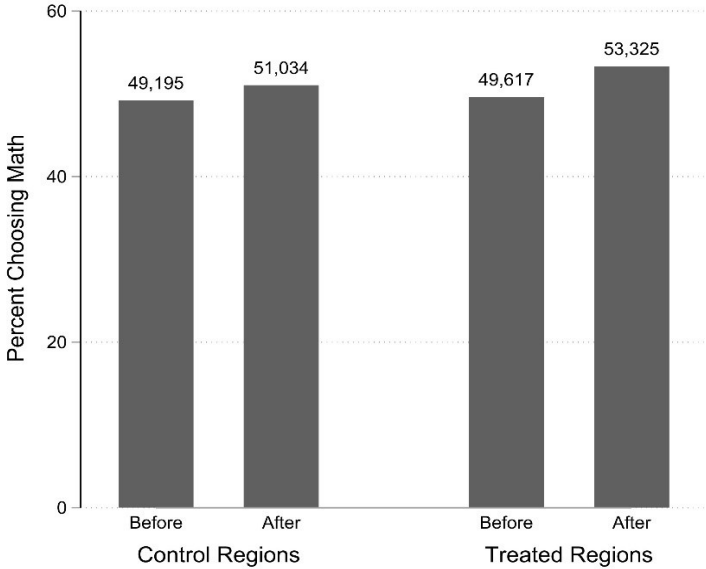


Table A2.1: **Dummy Treatment and Matching**

	Panel A		Panel B	
	Dummy Treatment		PSM Matching	
	(1)	(2)	(3)	(4)
	Math	Ukrainian history	Math	Ukrainian history
Interaction	0.0278*** (0.00907)	-0.0298*** (0.00571)	0.0270*** (0.00840)	-0.0272*** (0.00624)
Student is Male	0.215*** (0.00916)	-0.188*** (0.0121)	0.214*** (0.00919)	-0.187*** (0.0117)
School FE	Yes	Yes	Yes	Yes
Observations	120,142	120,142	85,774	85,774
R^2	0.052	0.049	0.052	0.049

Notes: This table presents the results from estimating Equation 2.1 using standard DID and DID combined with Propensity Score Matching specifications. The analyses exclude data from the Crimea, Donetsk and Luhansk, Lviv, Volyn, Zakarpattia, and Chernivtsi regions of Ukraine. In all specifications, we restrict the sample to schools that can be followed from 2016 to 2019 and exclude 2018. The pre- and post-treatment periods are 2016 - 2017 and 2019, respectively. Columns 1 and 3 present the results from estimating Equation 2.1 using an indicator for choosing math in IET exams as a dependent variable. Columns 2 and 4 present the results from estimating Equation 1 when we use an indicator for choosing Ukrainian history in IET exams as a dependent variable. In all specifications, we exclude school cohorts with fewer than 25 and more than 200 students, and include only students who were aged 17 and 18 when they took the test. Controls include student sex, age, school-cohort size, and an urban dummy. The estimates include school fixed effects. Bootstrapped (1000 reps.) standard errors are clustered at the region level and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2.2: Migration Opportunities and Performance in Math Tests

	Panel A		Panel B	
	All School-cohorts		Between 20 to 300 students	
	(1)	(2)	(3)	(4)
	Standardized IET Math Test	Fail in IET Math Test	Standardized IET Math Test	Fail in IET Math Test
Interaction	-0.00390 (0.00337)	0.000547 (0.000806)	-0.00305 (0.00305)	0.000357 (0.000776)
Student is Male	-0.0708*** (0.0133)	0.0214*** (0.00453)	-0.0708*** (0.0133)	0.0214*** (0.00453)
School FE	Yes	Yes	Yes	Yes
Observations	64,138	64,138	63,585	63,585
R^2	0.005	0.003	0.005	0.003

Notes: This table presents the results from estimating Equation 2.1 using DID regression. The analyses exclude data from the Crimea, Donetsk and Luhansk, Lviv, Volyn, Zakarpattia, and Chernivtsi regions of Ukraine. In all specifications, we restrict the sample to schools that can be followed from 2016 to 2019 and exclude 2018. The pre- and post-treatment periods are 2016 - 2017 and 2019, respectively. Columns 1 and 3 present the results from estimating Equation 2.1 using standardized IET math exam scores as a dependent variable. Columns 2 and 4 present the results from estimating Equation 1 when we use the indicator for failing in the math exam as a dependent variable. In Panel B, we exclude school cohorts with fewer than 25 and more than 200 students. In all specifications, we include only students who were aged 17 and 18 when they took the test. Controls include student sex, age, school-cohort size, and an urban dummy. The estimates include school fixed effects. Bootstrapped (1000 reps.) standard errors are clustered at the region level and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2.3: Migration Opportunities and Performance in Ukrainian History Tests

	Panel A		Panel B	
	All School-cohorts		Between 20 to 300 students	
	(1)	(2)	(3)	(4)
	Standardized IET History Test	Fail in IET History Test	Standardized IET History Test	Fail in IET History Test
Interaction	-0.00501 (0.00375)	0.00197*** (0.000517)	-0.00475 (0.00367)	0.00193*** (0.00050)
Student is Male	-0.155*** (0.0196)	0.0320*** (0.00643)	-0.155*** (0.0196)	0.0320*** (0.00643)
School FE	Yes	Yes	Yes	Yes
Observations	81,920	81,920	81,340	81,340
R^2	0.019	0.010	0.019	0.010

Notes: This table presents the results from estimating Equation 1 using DID regression. The analyses exclude data from the Crimea, Donetsk and Luhansk, Lviv, Volyn, Zakarpattia, and Chernivtsi regions of Ukraine. In all specifications, we restrict the sample to schools that can be followed from 2016 to 2019 and exclude 2018. The pre- and post-treatment periods are 2016 - 2017 and 2019, respectively. Columns 1 and 3 present the results from estimating Equation 1 using standardized IET Ukrainian history exam scores as a dependent variable. Columns 2 and 4 present the results from estimating Equation 1 when we use the indicator for failing in the Ukrainian history exam as a dependent variable. In Panel B, we exclude school cohorts with fewer than 25 and more than 200 students. In all specifications, we include only students aged 17 and 18 when they took the test. Controls include student sex, age, school-cohort size, and the urban dummy. The estimates include school fixed effects. Bootstrapped (1000 reps.) standard errors are clustered at the region level and reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2.4: **Migration Opportunities and Subject Choice**

	Panel A		Panel B	
	All School-cohorts		Between 20 to 300 students	
	(1)	(2)	(3)	(4)
	Math	Ukrainian history	Math	Ukrainian History
Interaction	0.00142 (0.00128)	-0.000961 (0.000920)	0.00146 (0.00131)	-0.00101 (0.000945)
Student is Male	0.215*** (0.00915)	-0.188*** (0.0120)	0.215*** (0.00915)	-0.188*** (0.0120)
School FE	Yes	Yes	Yes	Yes
Observations	120,913	120,913	120,912	120,912
R^2	0.052	0.048	0.052	0.049

Notes: This table presents the results from estimating Equation 1 using DID regression. In all specifications, we use intentions to migrate to non-EU countries as our measure of exposure to the visa liberalization policy. The analyses exclude data from the Crimea, Donetsk and Luhansk, Lviv, Volyn, Zakarpattia, and Chernivtsi regions. In all specifications, we restrict the sample to schools that can be followed from 2016 to 2019 and exclude 2018. Columns 1 and 3 present the results from estimating Equation 1 using an indicator for choosing math in IET exams as a dependent variable. Columns 2 and 4 present the results from estimating Equation 1 when we use an indicator for choosing Ukrainian history in IET exams as a dependent variable. In Panel B, we exclude school cohorts with fewer than 25 and more than 200 students. In all specifications, we include only students who were aged 17 and 18 when they took the test. Controls include student sex, age, school-cohort size, and an urban dummy. Base year mean refers to the average probability of choosing math and Ukrainian history before 2018. The estimates include school fixed effects. Bootstrapped (1000 reps.) standard errors are clustered at the region level and reported in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

3 Chapter

Remittances, Exchange Rate Shocks and Human Capital Formation in Origin Countries

Abstract

The well-being of many households in developing countries depends on overseas remittances, making them vulnerable to economic shocks in migrant's host countries. Decreases in remittances due to adverse shocks in host countries may affect human capital formation in origin countries. Using across-region variation in exposure to the sharp fall in the value of the Russian ruble in 2014, we examine the impact of remittances on classroom-level educational performance in Armenia. We find that the 2014 decrease in the value of remittances significantly decreased the performance of 12th-grade students in math. However, we find no evidence that remittances affected the performance of fourth- and ninth-grade students. The negative effect was larger for boys than for girls. We provide suggestive evidence that this is likely driven by an increase in employment for boys relative to girls, as boys are more likely to engage in paid work to compensate for a loss of income due to reduced remittances.

JEL codes: I21, F2

Keywords: Remittances, Spillover effects, Children Left Behind, Student Performance

3.1 Introduction

International seasonal migration substantially increases household income and relaxes credit constraints (Agunias & Newland, 2007). Seasonal migrant workers typically send remittances to their families left behind in their origin countries. A significant share of children in many developing countries lives in remittance-receiving families. Therefore, it is essential to understand whether a decrease in household remittance income due to an economic shock in the host country affects the human capital formation of children left behind in origin countries. Most previous research on the effects of seasonal migration on children left behind focuses on the outcomes of migrant children (Adunts, 2021; Amuedo-Dorantes et al., 2010; Antman, 2011a, 2011b; Clemens & Tiongson, 2017; Koska, Saygin, Çağatay, & Artal-Tur, 2013; McKenzie & Rapoport, 2011; Yang, 2008). However, seasonal migration may also have important spillover effects on children from non-migrant households. For example, increased spending due to remittances may boost the local economy and provide jobs to local workers, which will help families not directly involved in seasonal migration to invest more in their children’s education (Theoharides, 2018). Therefore, studies focusing solely on children left behind are likely to underestimate the overall effects of seasonal migration on children’s educational performance in origin communities.

An important exception is a study conducted by Theoharides (2018), who investigates the impact of international migration on school enrolment at the local labor market level to capture potential spillover effects on children from non-migrant families. Her findings suggest that international migration positively correlates with overall secondary school enrollment in the Philippines. However, increased school enrolment may not necessarily improve the actual knowledge of children (Karki Nepal, 2016). For example, there is evidence that school enrolment has significantly increased over the last decades, but the literacy rate has mostly remained the same in many developing countries across Africa and Asia (Banerjee, Cole, Duflo, & Linden, 2007). Therefore, it is essential to examine educational outcomes beyond

school enrolment and expenditures. Furthermore, there may be essential peer effects of children left behind on their non-left behind classmates related to changes in student behavior, classroom composition, and relative rank in the class (Bertoni & Nisticò, 2023; Burke & Sass, 2013; Elsner & Ispording, 2017; Mouganie & Wang, 2020; Murphy & Weinhardt, 2020; Wang & Zhu, 2021).

This paper examines the impact of remittances on classroom-level educational performance in Armenia, where one out of five children has a father who is a seasonal migrant worker. We first focus on educational performance at the classroom level, capturing not only the spillover effects to non-migrant families in the local economy, but also peer effects on children from non-migrant families who study in the same classroom. Second, in contrast to most previous studies¹⁰ that use school enrolment or the probability of completing high school as a proxy for the educational performance of children left behind, we use actual student performance measured by their exam scores. This measure of student performance allows us to explore some of the possible effects of parental seasonal migration on the intensive margin of educational performance.

We identify the effect of remittances on children’s educational performance in origin communities by exploiting variation in exposure to the sharp decrease in the value of the Russian ruble following the annexation of Crimea in March 2014. In the second half of 2014, the ruble was devalued by almost 40 percent relative to the Armenian dram. This devaluation was not anticipated in advance by Armenian migrant workers, and significantly decreased the value of remittances they sent back to Armenia. However, there is no evidence that seasonal workers immediately returned after observing the fall of the ruble. The devaluation did not affect all regions of Armenia equally. The effect was larger for regions with a larger share of the population who were seasonal workers in Russia prior to the exchange rate shock. We exploit this heterogeneity in the exposure to the devaluation of the Russian ruble

¹⁰To the best of our knowledge, Bai et al. (2018) is the only paper to study the effects of international parental migration on test scores.

across Armenian regions to obtain a causal estimate of the effect of remittances on student performance in school.

Our findings suggest that devaluation of the ruble had no significant effect on fourth- and ninth-grade student math performance. We find that it did significantly decrease the performance of 12th-grade students in math, but not in foreign languages. This observed negative effect was larger for boys than girls. There are several potential explanations for the differential effect of remittances by gender, age, and subject, but due to data limitations, we are not able to identify the exact mechanisms. However, we speculate on several possible reasons for the effects. First, on average, boys are more likely to engage in paid work to compensate for the loss of income due to the reduction of remittances. In the Results section, we provide suggestive evidence that the increase in employment for boys relative to girls likely drives the gender differences in the effect of remittances.

Second, older students are more likely to be engaged in paid work than younger students. If changes in the employment of students are the main drivers of the effect of the fall of the Russian ruble on schoolchildren, the absence of any significant effect on the performance of younger students is not surprising. Finally, boys on average are less likely to choose foreign language exams, and even before the ruble was devalued, significantly underperformed girls in languages. Given that the negative effect of the ruble devaluation was larger for boys, it is not surprising to find a negative effect in math but not in foreign languages.

The remainder of this paper is organized as follows. Section 2 discusses the institutional setting and describes the data used in this paper. Section 3 describes the empirical specification and our identification strategy. The results on the impact of the devaluation of Russian Ruble on the educational performance of students are in Section 4, and Section 5 concludes.

3.2 Institutional Setting and Data

3.2.1 Institutional Setting

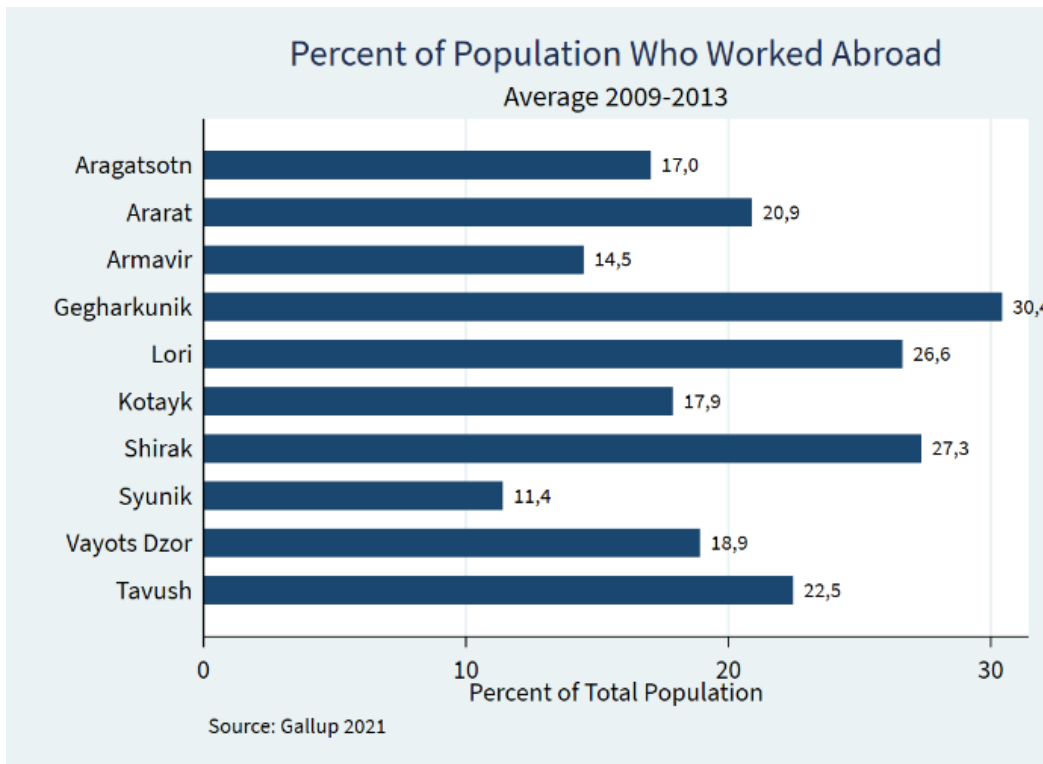
Most Armenian schools provide education at three levels: Primary, Secondary, and High. Those are usually separate schools in large urban areas. However, in rural areas, those three levels are usually combined in one single school. Public schooling is free and compulsory until the age of sixteen (e.g., ninth grade). Almost all children in Armenia complete the secondary schooling level (high school or equivalent), which takes 12 years. Students are allowed to apply for university programs only if they graduate high school. Universities admit students based on their final exam scores from different subjects. Depending on the field of studies, these subjects can differ, but the typical subjects required for university entrance in the majority of study fields are Armenian, English, and mathematics. Entry to universities is highly competitive, and there is even tighter competition for a small number of public scholarships. Therefore, most high school students take paid tutoring classes, mainly concentrated in the last year of their studies. These tutoring classes are relatively expensive, and anecdotal evidence suggests that their costs range from 30 to 100 per month and per subject depending on location (rural or urban) and the teacher's qualifications. An average student takes tutoring classes in at least two subjects for one academic year. The tutoring cost for an average Armenian household constitutes a sizeable financial burden.

Seasonal migration to Russia tends to be a primary income for a considerable number of Armenian families, especially in regions outside Yerevan. According to a labour statistics survey conducted by the Russian-Armenian University, in 2013, around 21% of the Armenian male labour force worked abroad. The main destination of these labour migrants is Russia (90.6%). The overwhelming majority (82.1%) of Armenian labour migrants are men, and the majority of them (61.3%) are married. Mainly because of the type of jobs they migrate for (e.g., construction, agriculture), most seasonal migrants leave Armenia in spring and return by the end of autumn/beginning of winter. These general conditions make Armenia a suitable

country to study the effects of seasonal migration, especially in the context of children left behind, given that most Armenian seasonal migrants have families left behind.

In the second half of 2014, the Russian Rubble devalued by almost 40 percent relative to the Armenian Dram. This devaluation significantly decreased the purchasing power of remittances sent back to Armenia. However, not all regions of Armenia were equally affected by the fall of the Russian Rubble. Figure 3.1 below shows the percentage of the population that worked abroad averaged from 2009 to 2013. Most of those who reported working abroad were seasonal workers in Russia. The ranking of regions in terms of the share of its population working abroad is almost unchanged when we focus on families with children under 15 (Figure A3.4). There is a significant variation in the share of the population that worked abroad prior to the fall of the Russian Rubble.

Figure 3.1: **Percent of Population Who Worked Abroad by Region**



Regions with a larger share of the population who were seasonal workers in Russia

before the fall of the Rubble would be more affected by the policy change compared to regions with a smaller share of the population who worked in Russia. We exploit this heterogeneity in the exposure to the fall of the Russian Rubble across regions of Armenia to obtain a causal estimate of the effect of remittances on the student's performance in school. Figure A3.5 in the appendix presents the distribution of the math grades of exams taken before and after the exchange rate shock in highly exposed (treated) and less exposed (control) regions. Before 2014, the average math exam grade in treated regions was higher than in control regions. However, after the exchange rate shock, this gap declined. Average math test scores in both regions declined after the exchange rate shock, however, in treated regions this decline was approximately three times larger (Figure A3.6). This provides the first suggestive evidence that regions with relatively high prior exposure to seasonal migration to Russia were more affected by the exchange rate shock than regions with less exposure.

3.2.2 Data

The primary data used in this study is from the official websites of public schools in Armenia. Starting from 2011, all Armenian public schools published class-level data on student performance evaluated in the fourth, ninth, and twelfth grades. They also publish a variety of other information, including the number of dropouts, the number of students who change schools, the number of students who left the country, school and class size, university admission rates, and information about teachers, including the number of teachers employed, their age, gender, average salary, and the percentage of teachers who hold higher education degrees. There are 1,385 public and 47 private schools in Armenia. Most of the private schools are in the capital city (39 out of 47). Our sample does not include private schools, as there is no requirement for them to provide publicly available reports on school characteristics and student performance. However, the exclusion of private schools is not likely to affect our results, as they constitute a very small share of Armenian schools.

This study focuses on rural schools, because rural areas are more exposed to seasonal

migration. There are 884 public schools in rural areas, of which 638 from 10 regions are included in our sample¹¹. Although, according to the law, all public schools in Armenia are required to publish data on average student performance and school-level characteristics, not all schools complied consistently. When there was missing information for some schools or years, we contacted the schools and asked them to provide the missing data. Most of the schools did provide the data on the key variables of interest, including average student performance by grade and class size, after we contacted them. However, information about the number of students who receive free books, university admission rates, and girls' average performance compared to boys was usually not available. Table 3.1 presents descriptive statistics of the main variables of our sample.

Table 3.1: **Summary Statistics**

Variables	Obs.	Mean	Std.Dev.	Min	Max
	(1)	(2)	(3)	(4)	(5)
Math Grade 12	2,936	12.23	1.602	8	17.20
Math Grade 9	4,025	5.970	1.123	4	8.845
Math Grade 4	4,301	7.283	0.783	4.220	9.5
Foreign Language Grade 12	2,932	6.640	0.794	4	9.5
Boys vs Girls Performance Ratio	1,276	0.855	0.461	0.1	3.33
Percent Admitted to the University	2,393	36.16	12.47	5	65

Notes: This table shows the summary statistics of the main variables of our sample. The sample excludes data from Yerevan. Additionally, we restrict the sample to rural schools. Source: Author's calculations based on the data from the school websites (2012-2019).

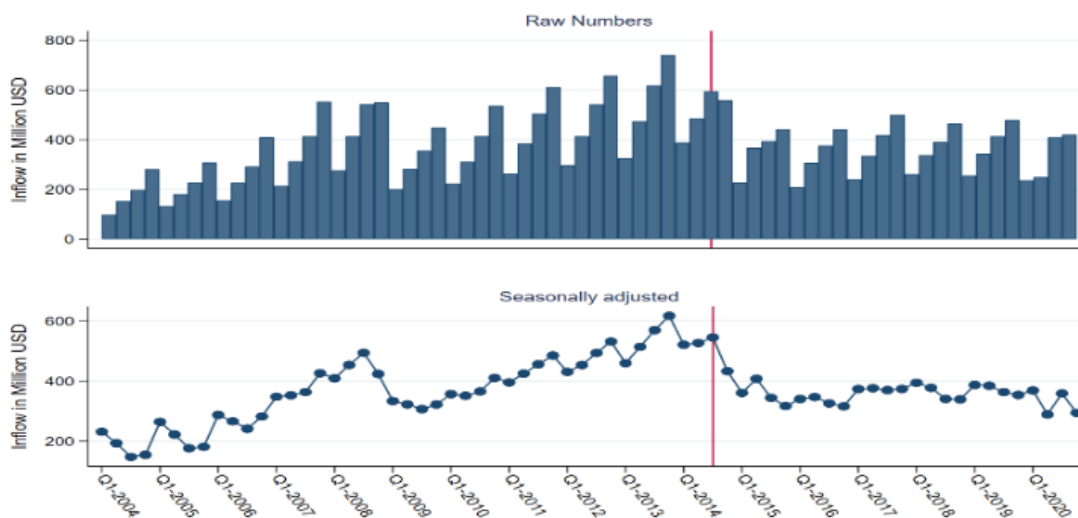
One important limitation of our data is that we do not observe the actual amounts of remittances, either at the individual or at the school or community level. However, even if we had access to such data, it is likely to be affected by severe measurement error, as remittances are likely to be underreported (Grigoryan & Khachatryan, 2018). Instead, we focus on identifying the effect of the devaluation of the ruble on student performance. Assuming that seasonal migrants respond to the devaluation event by sending (weakly) more money home

¹¹Even though all schools are required to publish the data, some schools failed to do so either because of their very small size or for some other reason unknown to us.

to compensate for the ruble’s loss of purchasing power in Armenia, the reduced form effect identifies the upper bound of the effect.

From the country-level data, we know that the aggregate inflows of remittances fell significantly after July 2014 (which coincides with the academic year 2014-2015) and did not recover afterward. This drop is visible in Figure 3.2, which shows the inflow of remittances to Armenia over the period 2004-2020. Although the returns to seasonal migration work decreased dramatically after the ruble fell, seasonal workers did not respond immediately. There is no evidence suggesting that the number of seasonal workers fell significantly one year after the shock, as documented in Appendix Figure A3.1, showing the number of Armenian migrants to Russia.

Figure 3.2: **Remittance Inflows into Armenia by Quarter (Million USD)**



3.3 Empirical Specification

The main empirical problem in identifying the effect of the devaluation of the Russian currency is that the fall of the ruble affected everyone in Armenia. Comparing the performance of cohorts before and after the fall of the ruble requires us to make an unrealistic assumption

that there are no effects of the devaluation or of contemporaneous events other than their effect through remittances.

To overcome this issue, we exploit the fact that not all geographic regions of Armenia were affected equally by the fall of the ruble. Regions with a larger share of the population working in Russia prior to the fall of the ruble should be more affected by the policy change than were regions with a smaller share. We exploit this heterogeneity in the exposure to the fall of the ruble across regions of Armenia and use the Difference in Difference (DID) estimation strategy to obtain a causal estimate of the effect of remittances on student performance in school. We use our class-school-level data to estimate the following DID regression model:

$$M_{sgt} = \beta_0 + \beta_1(Share_r * Post_t) + FE_s + \gamma_t + \varepsilon_{sg} \quad (3.1)$$

Where M_{sgt} is a vector of outcome variables (in our case M_{sgt} is a vector of average math and foreign language exam scores aggregated at class level), in school s at grade g and year t . The main variable of interest is the interaction of $Share_r$, which represents the percentage of population at the regional level working abroad prior to the fall of the ruble, and $Post_t$, which is an indicator variable that equals one for the period after the fall of ruble and zero otherwise. In the Results section, we also use an indicator for regions with a high percentage of population working abroad (defined as the regions from the top quantile in terms of percent of adults working abroad) instead of a continuous measure of the share of population working abroad. The coefficient β_1 shows the differential effect of the fall of the ruble for a region with a one percentage point higher pre-period population working abroad. We also include year γ_t and school FE_s fixed effects to control for observed and unobserved time invariant school characteristics. ε_{sg} is the error term.

The identifying assumption for β_1 to be a valid estimate of the causal effect of the devaluation of the ruble is that the performance of students in regions with different pre-period

shares of population working abroad would have moved in parallel in the absence of the fall. In Appendix Figure A3 we provide a graphical test of the plausibility of the parallel trend assumption. There is no evidence of differential trending across regions with high and low shares of population working abroad. Additionally, seasonal migrant workers may have responded to the decrease in the purchasing power of the ruble by increasing the amount of remittances they sent to Armenia, potentially “compensating” for the devaluation. If true, and assuming that this “compensation” effect was more pronounced in the regions with higher prior seasonal migration rates, this will lead to attenuation bias into our estimates of β_1 . Therefore β_1 identifies the lower bound of the true effect of the fall of the ruble.

Another potential challenge is that devaluation of the ruble may have affected the performance of students through other channels not related to remittances. For example, because Russia is the largest export destination for Armenia, the devaluation of the ruble may have decreased the demand for agricultural products from Armenia, both in terms of prices and of total production. Therefore, many households in rural areas may be affected not by the fall in the value of remittance inflows, but through changes in prices for agricultural products that were in high demand prior to the fall of the ruble. This may introduce upward bias in the estimation results. In our Results section, we show that the fall of the ruble had little or no immediate effect on either total agricultural production or on the prices of the agricultural products that are most likely to be affected by adverse economic conditions in Russia (e.g., apricots, tomatoes, grapes, etc.). Therefore, our results are not likely to be driven by indirect effects of the devaluation of the ruble on prices for agricultural products or on total agricultural output.

3.4 Results and Discussion

This section provides empirical results from estimating Equation 3.1. According to our results, the devaluation of the ruble had a differentiated impact on the average performance

of students, depending on the grade the students are in. The estimation results of Equation 3.1 by grade demonstrate that the fall of the ruble has no significant effect on the math performance of 4th and 9th-grade students (Table 3.2, Columns 1 and 2). For 12th-grade students, we find that the event significantly decreased their performance in math, but not in foreign languages (Table 3.2, Columns 3 and 4). Specifically, the results suggest that students from regions with a one percentage point larger pre-period population working abroad experienced a decrease in math performance of approximately 0.0073 standard deviations. For the sake of interpretation, we rescale the results by the magnitude of the interquartile range of the share of the population working abroad, which is 9.593 percentage points. As a result, moving from the 25th percentile of the percent of the population working abroad at baseline to the 75th percentile results in an approximately 0.07 standard deviation decline in math performance¹².

Table 3.2: The Effect of the Fall of the Russian Ruble on Performance of Students

	(1)	(2)	(3)	(4)	(5)
	Grade 4 Math	Grade 9 Math	Grade 12 Math	Grade 12 Foreign Language	Boys vs Girls Performance Ratio
Interaction	-0.00372 (0.00306)	-0.000123 (0.00238)	-0.00731** (0.00338)	0.00154 (0.00399)	-0.0145*** (0.00333)
Pre-period Mean	-	-	-	-	0.880
School FE	Yes	Yes	Yes	Yes	Yes
Observations	4,085	4,085	2,822	2,820	1,286

Notes: This table presents the results from estimating equation (3.1) using school-level data. Reported results are obtained via DID regression. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Additionally, we find that the share of high-achieving boys relative to girls declined dramatically after devaluation of the ruble. Specifically, the results reported in Column 5 of Table 3.2 suggest that the ratio of high-achieving boys versus girls declined by approximately 1.64 percent ($0.0145 \times 100 / 0.880$) in regions with one percentage point more of its population

¹²One standard deviation in the share of seasonal workers is 6.026. Therefore, one standard deviation increase in the share of the seasonal worker population results in an approximately 0.044 standard deviation decline in math performance.

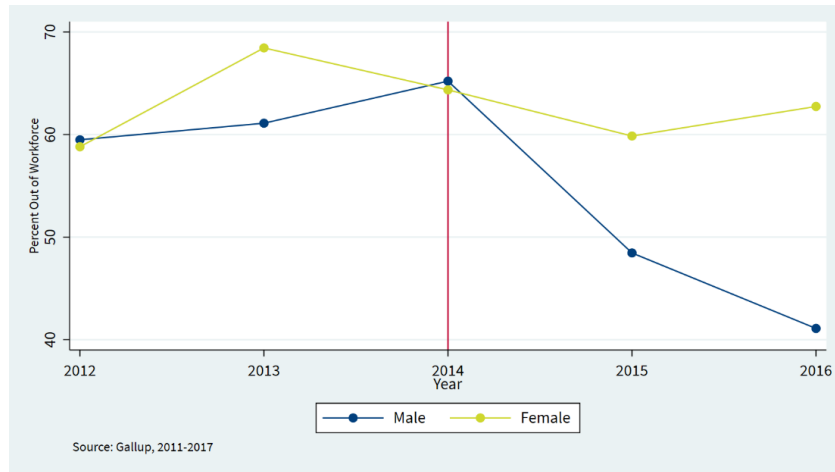
working abroad pre-period. Therefore, moving from the 25th percentile of the percent of the population working abroad at baseline to the 75th percentile leads to an approximately 15.73 percent decline in the ratio of high-achieving boys versus girls. We find similar results when we use indicators for regions with a high percentage of population working abroad instead of a continuous measure (Table A3.1).

There are several potential explanations for the differential effect of the value of remittances by gender, age, and subject. We cannot identify the exact mechanisms due to data limitations. However, there are several potential explanations. First, on average, boys are more likely to engage in paid work to compensate for a loss of income due to reduced value of remittances. Figure 3.3 below plots the share of young adults aged 15-22 who were out of the workforce before and after the fall of the ruble by gender. The share of boys who were out of the workforce declined more steeply compared to girls after the devaluation. This provides suggestive evidence that boys likely moved into employment instead of continuing their education to compensate for the loss of household income.

Furthermore, older students are more likely to move into employment (either formally or informally) than are younger students. If the changes in student employment are the main drivers of the effect of the devaluation of the ruble, the absence of any significant effect on the performance of younger students is not surprising. Finally, boys were less likely to choose foreign language exams and significantly underperformed compared to girls in languages prior to the event. Given that the negative effect of the ruble's devaluation was larger for boys, it is not surprising to find a negative effect in math but not in foreign languages.

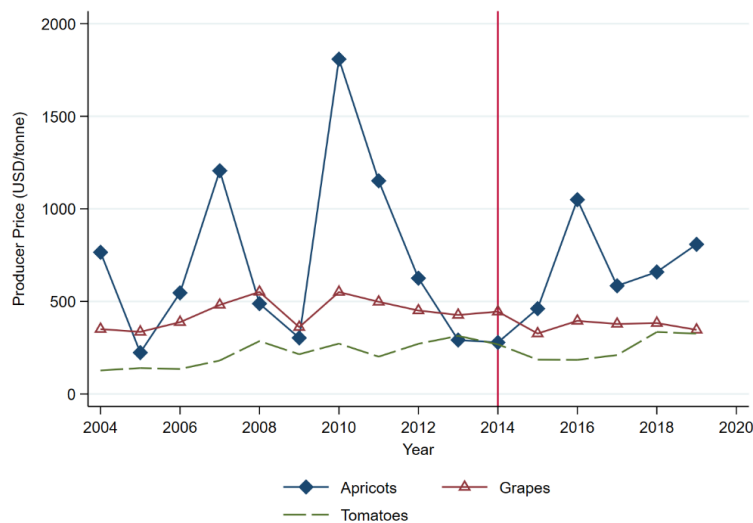
As we discussed in Section 3, another potential challenge with the empirical specification given by equation (3.1) is that devaluation of the ruble may affect the performance of students from rural schools by decreasing the prices and total production of Armenian agricultural products. Therefore, many households in rural areas may be affected not by the fall in the value of remittances inflows, but through changes in prices for agricultural products that were in high demand prior to the event. To test whether this is an issue in this

Figure 3.3: Percent of Youth Out of the Workforce by Gender



particular case, we check whether the prices of selected agricultural products that are most likely to be affected by adverse economic conditions in Russia (e.g., apricots, tomatoes, and grapes) decreased, and find that the producer prices for tomatoes and grapes did decrease slightly within one year after the fall of the ruble (Figure 3.4).

Figure 3.4: Producer Prices for Selected Fruits in Armenia



However, the largest tomato and grape producing regions experienced lower than

average seasonal migration rates prior to the ruble’s devaluation (were in the control group). Therefore, the falling prices of these products will result in underestimation of the “true” effect of the remittances. Additionally, the producer prices for apricots increased after the ruble devaluation, potentially compensating for the decrease in producer prices for tomatoes and grapes. We also check whether the total agricultural output changed after the devaluation, and find no evidence of a negative effect (Figure A3.2). Therefore, our results are not likely to be driven by the possible negative effects of the devaluation on prices for agricultural products or total agricultural output.

3.5 Conclusion

We use class-school-level administrative data to examine the impact of seasonal migration on the educational performance of children left behind in Armenia. Focusing on performance at the classroom level captures the peer effects of left-behind children on their non-left-behind classmates. We identify the effect of remittances on children’s educational performance in origin communities by exploiting the variation in exposure to the sharp devaluation of the Russian ruble following Russia’s annexation of Crimea in March 2014. There is a significant variation across regions of Armenia in terms of the share of the population who were seasonal workers in Russia prior to the fall of the ruble. We exploit this heterogeneity in exposure to the devaluation across regions of Armenia and use the Difference in Difference (DID) estimation strategy to obtain a causal estimate of the effect of remittances on student performance in school. Our findings suggest that the 2014 devaluation of the ruble had no significant effect on fourth- and ninth-grade student math performance. However, it significantly weakened the performance of 12th-grade students in math, but not in foreign languages. This observed negative effect was larger for boys than for girls. Overall, our findings shed light on how adverse shocks in destination countries can affect human capital development in seasonal migrant-sending areas.

Appendix

Figure A3.1: The Number of Migrants from Armenia to Russia

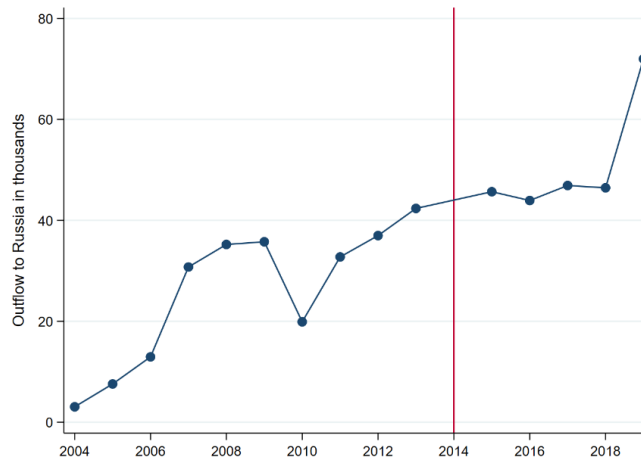


Table A3.1: The Effect of the Fall of the Russian Ruble on Performance of Students

	(1) Grade 4 Math Math	(2) Grade 9 Math Math	(3) Grade 12 Math Math	(4) Grade 12 Foreign Language	(5) Boys vs Girls Performance Ratio
Interaction	-0.0719* (0.0436)	0.00293 (0.0344)	-0.131*** (0.0464)	0.0332 (0.0549)	-0.192*** (0.0448)
School FE	Yes	Yes	Yes	Yes	Yes
Observations	4,085	4,085	2,822	2,820	1,286

Notes: This table presents the results from estimating equation (3.1) using school-level data. Reported results are obtained via DID regression. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure A3.2: Production Quantity by Type, Armenia

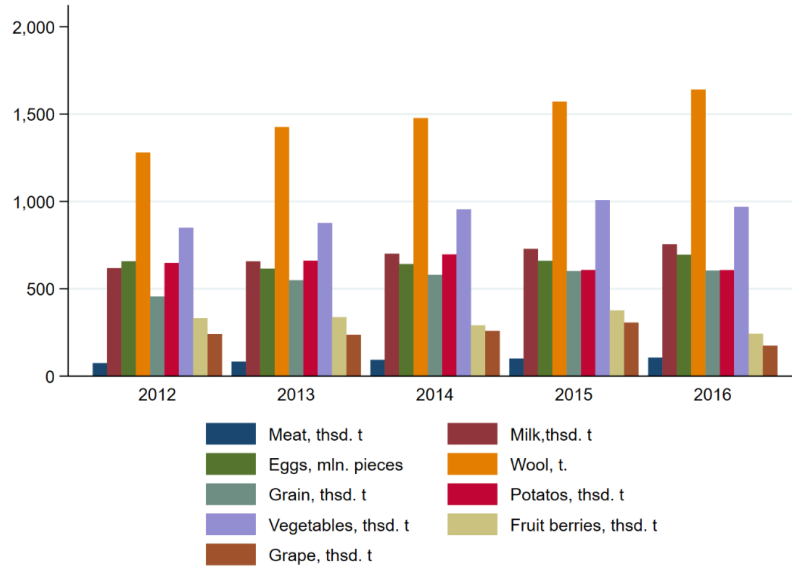


Figure A3.3: Graphical Test for the Parallel Trends Assumption

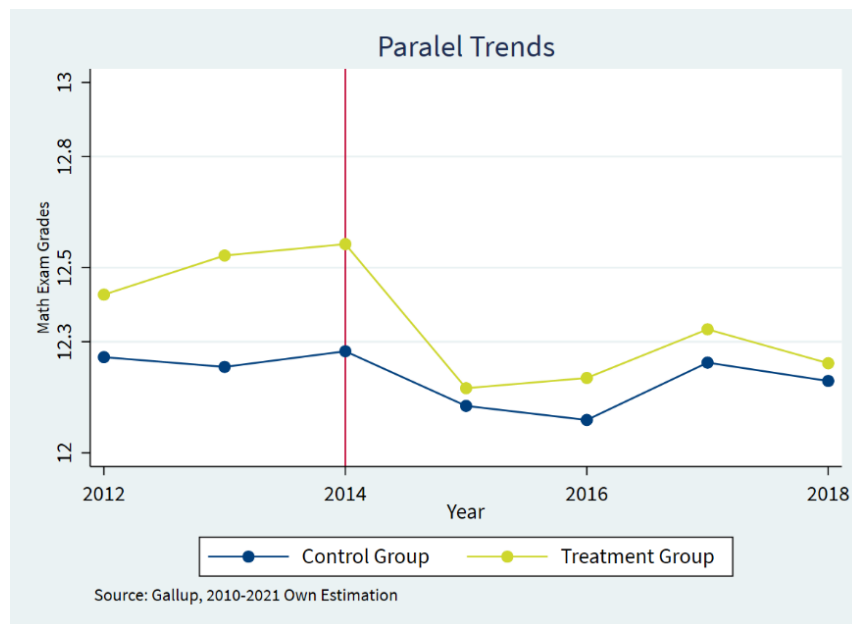
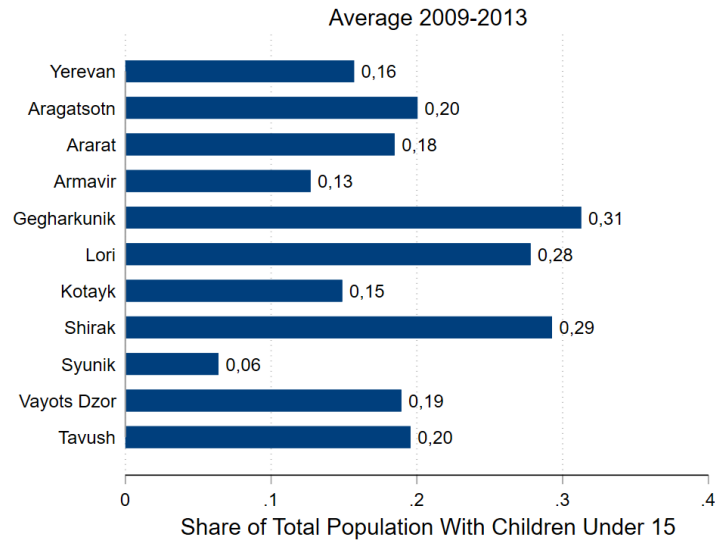
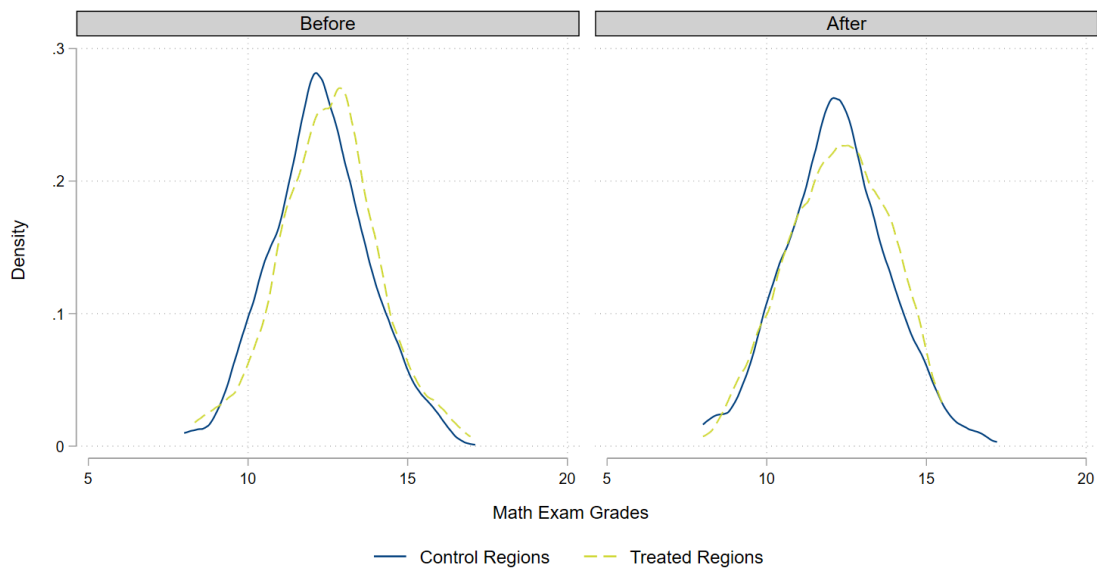


Figure A3.4: Percent of the Armenian Population with Children Under 15 Who Worked Abroad by Region



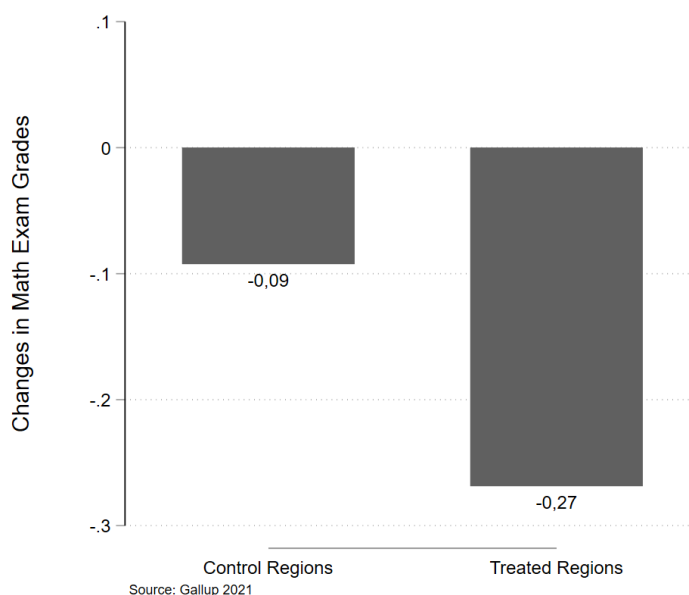
Source: Gallup 2021

Figure A3.5: Distribution of Math Exam Grades in Treated and Control Regions Before and After the Exchange Rate Shock



Source: Gallup 2021

Figure A3.6: Changes in Math Exam Grades Before and After the Exchange Rate Shock in Treated and Control Regions



References

- Abarcar, P., & Theoharides, C. (2021). Medical worker migration and origin-country human capital: Evidence from us visa policy. *Review of Economics and Statistics*, 1–46.
- Adunts, D. (2021). Paternal circular migration and development of socio-emotional skills of children left behind. *CERGE-EI Working Paper Series(696)*.
- Agostinelli, F., & Sorrenti, G. (2018). Money vs. time: family income, maternal labor supply, and child development. *University of Zurich, Department of Economics, Working Paper(273)*.
- Agunias, D. R., & Newland, K. (2007). *Circular migration and development: Trends, policy routes, and ways forward*. MPI.
- Alan, S., Boneva, T., & Ertac, S. (2019). Ever failed, try again, succeed better: Results from a randomized educational intervention on grit. *The Quarterly Journal of Economics*, 134(3), 1121–1162.

- Amuedo-Dorantes, C., Georges, A., & Pozo, S. (2010). Migration, remittances, and children's schooling in haiti. *The Annals of the American Academy of Political and Social Science*, *630*(1), 224–244.
- Amuedo-Dorantes, C., & Pozo, S. (2010). Accounting for remittance and migration effects on children's schooling. *World development*, *38*(12), 1747–1759.
- Antman, F. M. (2011a). International migration and gender discrimination among children left behind. *American Economic Review*, *101*(3), 645–49.
- Antman, F. M. (2011b). The intergenerational effects of paternal migration on schooling and work: What can we learn from children's time allocations? *Journal of Development Economics*, *96*(2), 200–208.
- Antman, F. M. (2015). Gender discrimination in the allocation of migrant household resources. *Journal of population economics*, *28*(3), 565–592.
- Bai, Y., Zhang, L., Liu, C., Shi, Y., Mo, D., & Rozelle, S. (2018). Effect of parental migration on the academic performance of left behind children in north western china. *The Journal of Development Studies*, *54*(7), 1154–1170.
- Banerjee, A. V., Cole, S., Duflo, E., & Linden, L. (2007). Remedying education: Evidence from two randomized experiments in india. *The quarterly journal of economics*, *122*(3), 1235–1264.
- Batista, C., Lacuesta, A., & Vicente, P. C. (2012). Testing the 'brain gain' hypothesis: Micro evidence from cape verde. *Journal of Development Economics*, *97*(1), 32–45.
- Beine, M., Docquier, F., & Rapoport, H. (2008). Brain drain and human capital formation in developing countries: winners and losers. *The Economic Journal*, *118*(528), 631–652.
- Bertoni, M., & Nisticò, R. (2023). Ordinal rank and the structure of ability peer effects. *Journal of Public Economics*, *217*, 104797.
- Bono, E. D., Francesconi, M., Kelly, Y., & Sacker, A. (2016). Early maternal time investment and early child outcomes. *The Economic Journal*, *126*(596), F96–F135.
- Burke, M. A., & Sass, T. R. (2013). Classroom peer effects and student achievement. *Journal*

- of Labor Economics*, 31(1), 51–82.
- Carneiro, P., & Rodrigues, M. (2009). Evaluating the effect of maternal time on child development using the generalized propensity score. *Institute for the study of Labor, 12th IZA European Summer school in Labor economics*.
- Chand, S., & Clemens, M. A. (2019). Human capital investment under exit options: Evidence from a natural quasi-experiment.
- Clemens, M. A., & Tiongson, E. R. (2017). Split decisions: household finance when a policy discontinuity allocates overseas work. *Review of Economics and Statistics*, 99(3), 531–543.
- Clifton-Sprigg, J. M. (2019). Out of sight, out of mind? the education outcomes of children with parents working abroad. *Oxford Economic Papers*, 71(1), 73–94.
- Constant, A. F., Nottmeyer, O., & Zimmermann, K. F. (2013). The economics of circular migration. In *International handbook on the economics of migration*. Edward Elgar Publishing.
- Credé, M., Tynan, M. C., & Harms, P. D. (2017). Much ado about grit: A meta-analytic synthesis of the grit literature. *Journal of Personality and social Psychology*, 113(3), 492.
- Cuecuecha, A. (2009). The effect of remittances and migration on human capital: Evidence from Mexico.
- Davis, J., & Brazil, N. (2016). Disentangling fathers' absences from household remittances in international migration: The case of educational attainment in Guatemala. *International journal of educational development*, 50, 1–11.
- De Brauw, A., & Giles, J. (2017). Migrant opportunity and the educational attainment of youth in rural China. *Journal of Human Resources*, 52(1), 272–311.
- De La Garza, R. (2010). Migration, development and children left behind: A multidimensional perspective. *Social and Economic Policy working paper*, 1–37.
- Del Boca, D., Flinn, C., & Wiswall, M. (2014). Household choices and child development.

- Review of Economic Studies*, 81(1), 137–185.
- Di Bartolomeo, A., Makaryan, S., Mananashvili, S., & Weinar, A. (2012). Circular migration in eastern partnership countries: an overview.
- Dinkelman, T., & Mariotti, M. (2016). The long-run effects of labor migration on human capital formation in communities of origin. *American Economic Journal: Applied Economics*, 8(4), 1–35.
- Docquier, F., Peri, G., & Ruysen, I. (2014). The cross-country determinants of potential and actual migration. *International Migration Review*, 48, S37–S99.
- Docquier, F., & Rapoport, H. (2012). Globalization, brain drain, and development. *Journal of economic literature*, 50(3), 681–730.
- Dubenko, L., & Kravchuk, P. (2021). Ukrainian labour migration to the eu: State of play, challenges and solutions. *Analytical Report, Prague Process*.
- Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the short grit scale (grit-s). *Journal of personality assessment*, 91(2), 166–174.
- Elsner, B., & Ispording, I. E. (2017). A big fish in a small pond: Ability rank and human capital investment. *Journal of Labor Economics*, 35(3), 787–828.
- Evans, G. W. (2004). The environment of childhood poverty. *American psychologist*, 59(2), 77.
- Galla, B. M., Plummer, B. D., White, R. E., Meketon, D., D’Mello, S. K., & Duckworth, A. L. (2014). The academic diligence task (adt): Assessing individual differences in effort on tedious but important schoolwork. *Contemporary educational psychology*, 39(4), 314–325.
- Gibson, J., & McKenzie, D. (2014). Development through seasonal worker programs: the case of new zealand’s rse program. In *International handbook on migration and economic development*. Edward Elgar Publishing.
- Goldsmith-Pinkham, P., Sorkin, I., & Swift, H. (2020). Bartik instruments: What, when, why, and how. *American Economic Review*, 110(8), 2586–2624.

- Grigoryan, A., & Khachatryan, K. (2018). Remittances and emigration intentions: evidence from armenia. *CERGE-EI Working Paper Series*(626).
- Heckman, J. J., & Mosso, S. (2014). The economics of human development and social mobility. *Annu. Rev. Econ.*, 6(1), 689–733.
- Jiang, H., & Yang, X. (2019). *Parental migration, investment in children, and children's non-cognitive development: Evidence from rural china* (Tech. Rep.). GLO Discussion Paper.
- Karki Nepal, A. (2016). The impact of international remittances on child outcomes and household expenditures in nepal. *The Journal of Development Studies*, 52(6), 838–853.
- Kautz, T., Heckman, J. J., Diris, R., Ter Weel, B., & Borghans, L. (2014). Fostering and measuring skills: Improving cognitive and non-cognitive skills to promote lifetime success.
- Khanna, G., & Morales, N. (2017). The it boom and other unintended consequences of chasing the american dream. *Center for Global Development Working Paper*(460).
- Koska, O. A., Saygin, P. Ö., Çağatay, S., & Artal-Tur, A. (2013). International migration, remittances, and the human capital formation of egyptian children. *International Review of Economics & Finance*, 28, 38–50.
- Libanova, E., et al. (2019). Labour migration from ukraine: Key features, drivers and impact. *Economics and Sociology*, 12(1), 313–328.
- Løken, K. V., Lommerud, K. E., & Reiso, K. H. (2018). Single mothers and their children: Evaluating a work-encouraging welfare reform. *Journal of Public Economics*, 167, 1–20.
- Macours, K., & Vakis, R. (2010). Seasonal migration and early childhood development. *World development*, 38(6), 857–869.
- Mao, M., Zang, L., & Zhang, H. (2020). The effects of parental absence on children development: Evidence from left-behind children in china. *International Journal of Environmental Research and Public Health*, 17(18), 6770.

- McKenzie, D., & Rapoport, H. (2011). Can migration reduce educational attainment? evidence from Mexico. *Journal of Population Economics*, *24*(4), 1331–1358.
- Mota Aquino, J. M. (2023). *Essays on the economic causes and consequences of international migration* (Unpublished doctoral dissertation).
- Mouganie, P., & Wang, Y. (2020). High-performing peers and female STEM choices in school. *Journal of Labor Economics*, *38*(3), 805–841.
- Murphy, R., & Weinhardt, F. (2020). Top of the class: The importance of ordinal rank. *The Review of Economic Studies*, *87*(6), 2777–2826.
- Polish Ministry of Labour and Social Policy. (2018). *Ministry of labor and social policy*. Retrieved from <https://psz.praca.gov.pl/-/8180228-zezwolecia-na-prace-sezonowa-cudzoziemca> (Accessed on May 11, 2021)
- Saad, A. F., & Fallah, B. (2020). How educational choices respond to large labor market shocks: Evidence from a natural experiment. *Labour Economics*, *66*, 101901.
- Shrestha, S. A. (2017). No man left behind: Effects of emigration prospects on educational and labour outcomes of non-migrants. *The Economic Journal*, *127*(600), 495–521.
- Theoharides, C. (2018). Manila to Malaysia, Quezon to Qatar international migration and its effects on origin-country human capital. *Journal of Human Resources*, *53*(4), 1022–1049.
- Tjaden, J., Auer, D., & Laczko, F. (2019). Linking migration intentions with flows: Evidence and potential use. *International Migration*, *57*(1), 36–57.
- Ukrainian Center for Evaluation of the Quality of Education. (n.d.). <https://testportal.gov.ua/>. (Accessed: 2022-09-12)
- Wang, H., & Zhu, R. (2021). Social spillovers of China's left-behind children in the classroom. *Labour Economics*, *69*, 101958.
- Yang, D. (2008). International migration, remittances and household investment: Evidence from Philippine migrants' exchange rate shocks. *The Economic Journal*, *118*(528), 591–630.