IMPACT OF MIGRATION NETWORK
ON INCOME OF UKRAINIAN MIGRANTS

by

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Abstract

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This thesis investigates the effect of migration networks on income of Ukrainian emigrants, for the sample of 45477 observations on Ukrainian residents for the period of 2010-2012. Here, migration network is defined as family and friendship connections that help migrants to find a job abroad and/or to organize working contract, visa and other documents. In order to conduct such a research I follow the methodology suggested by Amuedo-Dorantes and Mundra (2007), who estimate the effect of the impact of migration networks on migrants' income for Mexican emigrants to the US. However, I use two specifications of the Heckman model: linear and ordinal probit. The obtained empirical results are as follows. Migration networks have different effect on different income groups of emigrants, in terms of probabilities to fall into higher income group. For lower income groups its effect is significant and negative (and it varies from -4.68% to -1.31%), for higher income groups it is positive (varies from 1.12% to 6.46%), but not for all high income groups it is significant. In terms of changes in average monthly wage of an emigrant, networking on average is associated with about USD120 increase in wage.

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GLOSSARY

Migration. The movement by people from one place to another with the intention of settling temporarily or permanently in the new location; the general name for emigration and immigration (both considered from the point of view of some given country).

Emigration. The act of leaving the given country in order to settle permanently ot for some time in another country; moving abroad.

Immigration. The act of settling in the receiving country after leaving own country.

Migration network. Family and friendship connections that help the migrant to find a job abroad and/or to organize working contract, visa, etc.

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INTRODUCTION

In this work, I would like to test the hypothesis whether migration networking helped Ukrainian migrants to achieve higher income level during the migration wave period from 2010 to 2012. We will consider migrants from the point of view of the sending country, so the attention will be stressed on Ukrainian emigrants. To define more accurately, emigrants of our consideration are those Ukrainian residents who were working or looking for a job abroad in 2010-2012.

According to International Organization for Migration (IOM) report "Migration in Ukraine: facts and figures" (2013), remittances to Ukraine increased dramatically despite the crisis. Faini (2006) suggests three possible explanations of these changes: a) the number of emigrants increased; b) migrants receive higher income in the host; c) cost of sending remittances declined.

The number of Ukrainian emigrants was decreasing in 2010-2012 (according to State Statistical Service of Ukraine: 14677 in 2010, 14588 in 2011 and 14517 in 2012), so a) is not true for Ukraine. As well, main destination countries did not change from 2008 to 2013, so there b) is also not true for Ukraine. So, in this work I am going to test the latter hypothesis by using as a theoretical foundation the network theory. More specifically, my hypothesis is the following: using the help of migration networks by an emigrant is associated with higher emigrant's income.

In this research, our attention will be focused on the money side of migration gains. Omitting the idea of remittances benefits in favor of the idea of migrants' income itself, we will consider the benefits measured in migrants' monthly average wage earned during employment abroad. This will allow us to account for not only those income received by people living in Ukraine as remittances, but also for the part of income that is left for migrants who earn it abroad. So, this measure will catch the whole welfare produced by migration, not only the part received as remittances.

Better understanding of processes connected with emigration allows the sending country to impede the more appropriate policies if needed. This is a phenomenon of a big scale and it is important for the government to pay attention to it, since the estimated by State Statistics Service and the Institute of Demography and Social Studies the number of Ukrainian emigrants for 2010-2012 is about 1.2 mln people which represents 3.4% of Ukrainian population of age 15-70. Therefore, the sending country should have incentives to provide care for its emigrants. One of the possible methods how to take care is creation and support of an organized government agency, which would manage social migration network issues, provide informational support for its members, allow to self-organize communication between migration network members, etc. However, creating and supporting of such organization, as well as providing any other policy directed to support migration network, has its own cost for the government. In order to choose the appropriate policy, the benefits should also be estimated. That is why, it is important to estimate the size of benefits that could be brought by interactions between Ukrainian emigrants in terms of the money earned abroad, which is the basis for possible remittances.

The expected result is that networking indeed helps to get a better paid job compared to those migrants who do not use the advantage of social networking. This will imply that migration outcomes could be managed by the government body in terms of better social protection of individuals undergoing migration experience.

Social networks play an important role in human's life, because they allow to exchange information quickly, and a higher level of cooperation between members of network results in mutually profitable outcomes. Network also affects the outcomes of a job search and assistance in the new place of living. The wider and more diverse is one's social network – the higher is the probability to find an appropriate help and better job option for a given individual. Talking about migration experience, we can expect that social migration network is supposed to help with easier assimilation in the destination countries, being exposed to a wider range of job opportunities, and as a result, finding a better job, and getting more sustained and safe conditions for employment and work, compared to those migrants who do not use the advantages of migration social networking.

Though there is a wide range of theories explaining the reasons lying under the initiation and continuation of international migration[1], in this work I would like to draw the reader's attention to the network theory, considering the case of Ukrainian migration.

Definitions of migration networks vary in different papers, from very narrow (e.g. equating to kinship only) to such that are as broad as it only could be

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[1] According to Massey et al. (1993), this range includes macro and micro theories, new economics theory, dual labor theory, world systems theory, network theory, institutional theory, migration systems theory, etc.

possible (e.g. a full set of all possible relations, including kinship, friendship and common citizenship, the same language proficiency, etc.). In more detail, these and other issues will be considered in Chapter 2 for literature overview for this topic. The research for Mexican emigrants done by Amuedo-Dorantes and Mundra (2007) is one of the most relevant papers to our research, and answers the question what is the effect of migration networks on migrants' earnings for Mexican migrants working in the US. It will also be discussed in literature section as well as other relevant literature. The last includes descriptive statistical publications on the actual picture of Ukrainian migration, revealing general information about the leading destination countries for Ukrainian migrants, their professional and educational backgrounds, legal issues, etc.

Chapter 3 of this paper describes the methods of examining the impact of migration networks on Ukrainian migrants' income level. We use the two-step Heckman's model correcting for sample selection. In our case, we approach the problem of estimation with three different specifications. Each one has the same first step of the Heckman's model, though it differs in the second step. Each considered specification would imply three different types of results interpretation.

Chapter 4 discusses the data used in the analysis, collected from the migration survey conducted by the State Statistics Service of Ukraine in 2013 for Ukrainian residents among whom are the migrants having their last work trip abroad or were looking for a job abroad from January 2010 to June 2012. Also, here we discuss how the variable measuring Ukrainian migration network is constructed using the existing dataset, as well as the variable measuring migrants' earnings, and variables to control other characteristics known to affect migrants' earnings.

Chapter 5 reveals the empirical results obtained after considering four different specifications of the Heckman's sample selection model. The results obtained are as follows. The network effect on income is significant in both specifications, and the sign of effect is different for different income categories to which emigrants get into. People from higher income categories have more chances to get even higher income due to networking, while for lower income categories, it is the other way around.

Finally, Chapter 6 discusses the obtained results and presents the major conclusions for the network theory applied to the Ukrainian migration system.

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LITERATURE REVIEW

This section is structured in the following way. It begins with the brief description of Ukrainian migration outflow characteristics discussed in several empirical reports issued by IOM, then we talk about theoretical papers on the Ukrainian migration topic. After this, it investigates the literature on other countries discussing the question of migration networks and its impact on migrants' employment outcomes, such as earnings.

2.1. Description of Ukrainian migration flows: empirics

According to the International Organization for Migration (IOM) report "Migration in Ukraine: facts and figures" (2013), the estimated net migration rate for Ukraine in 2010-2015 is about -0.2 migrants per 1000 of population[2]. With a distinction, the most popular destination country for Ukrainian emigrants is Russian Federation, it absorbs about 43% of all Ukrainian emigrants. The next most popular country is Poland with emigrants share of 14%, and then Italy and Czech Republic both taking 13% each. The list of main destination countries of Ukrainian labor migrants of 2010-2012 migration wave are presented in Table 1.

From 2010 to 2012, the estimated number of people working or looking for a job abroad totals to 1.2 mln of people, which is 3.4% of population of age 15-70, according to State Statistics Service and the Institute of Demography and

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[2] Net migration rate represents the difference between the number of immigrants and emigrants divided by 1000 of population, for specific time period. The negative value means that the outflow of migrants exceeds the inflow. Pointing to this number, IOM references to UNDESA, 2012.

Social Studies. The gender structure is the following: in 2010-2012, 65% of all Ukrainian migrants were males, and 35% were females.

Table 1. Destination countries of Ukrainian Labor Migrants (2010-2012)

#	Country	Share
1	Russian Federation	43%
2	Poland	14%
3	Italy	13%
4	Czech Republic	13%
5	Spain	5%
6	Hungary	2%
7	Portugal	2%
8	Other countries	8%

Source: IOM, "Migration in Ukraine: facts and figures" (2013)

The educational level of Ukrainian labor migrants is presented in Table 2. The most part (65%) of all migrants have only secondary education level. This results in the distribution of Ukrainian migrants' labor force mostly between low-skilled jobs: 46% is employed in construction, 18% - domestic care, 11% - agricultural sector, 9% - wholesale and retail trade, 16% - other (industry, hotel and restaurants sector, transport sector, etc.).

Table 2. Education level of Ukrainian Labor Migrants (2010-2012)

Education	Share
Complete higher	15%
Basic higher or uncompleted	15%
Secondary	65%
Basic secondary or primary	5%

Source: IOM, "Migration in Ukraine: facts and figures" (2013)

Talking about legal issues, only 38% of Ukrainian labor migrants (2010-2012) had residence and work permit, 13% - only work permit, and remaining 49% were not legally allowed to work. The detailed info is presented in Table 3.

Table 3. Legal status of Ukrainian Labor Migrants (2010-2012)

Status	Share
Residence and work permit	38%
Work permit	13%
Temporary registration	24%
No legal status	17%
Tourist visa	4%

Source: IOM, "Migration in Ukraine: facts and figures" (2013)

2.2. Theoretical literature

According to Kupets (2011), there are three main channels though which emigration can bring benefits to the sending country: "return migration, transfer of knowledge, technologies and investment, and remittances". As was found, return migration does not bring the expected advantages (e.g., higher level of human capital developed during the employment abroad), mostly because of downshifting when getting a job abroad, which happens mostly because of low language proficiency and inappropriate real educational background and skills level. Transfer of knowledge, technologies and investment is expected to happen mostly in cases when individuals set their own business in Ukraine after the migration experience, using the unique knowledge and experience earned abroad. This happens very rarely in Ukraine, a small number of return migrants start their business in Ukraine after emigration. The main reason for this is unfriendly business environment in Ukraine. So the impact of this channel of migration benefits is not considerable.

The only one channel left is remittances, which are usually a part of the income earned by emigrants. And in this paper, we will concentrate on a wider benefit concept such as emigrants' income, constituting GNP of the sending country. As the migrant's income is the basis for remittance transfers, this will allow us to account not only for the part of money directed to the home country, but

also for the part of earnings left to the migrant, who gains his individual benefits from earning the money.

According to Bodvarsson and Van den Berg (2009), the decision to migrate is driven by the wide range of economic, demographical, sociological, political, cultural, psychological and other issues. So, here we can mention educational level, marital status, age, presence of some property or own business, employment status before migration experience, etc. And there are lots of drivers and factors of individual income of a migrant: work experience, age, profession type, educational level, ability to communicate in the language of the destination country, the number of trips abroad before, etc. Besides other effects, in this paper we will be estimating the impact of migration networks on emigrant's income. In order to better understand what is the essence of migration networks, let us consider the previous literature on this topic.

The development of migration networks plays a big role in forming and supporting the migration flows. Boyd (1989) asserts that social relations are very important in migratory behavior, especially kinship, which is "a major source of personal networks in migration".

The network theory relies on the assumption that it is interpersonal ties between migrants and non-migrants that induce further migration flows. These interpersonal ties may be represented by different relations, such as kinship, friendship, or some common background features like the place of origin, common religion or common language of usage, etc. In general, they are called migrant networks, or migration networks. The network theory tells us that these migration networks increase the probability of international migration, mainly because of decreasing costs and risks of migration, while increasing the

probability to earn more, to seek for better job opportunities and to be protected in case of emergency (Massey et al. (1993)). The increase in migration diaspora increases the probability of new coming migrants even more, so this process is similar to the snowball effect.

First migrants are exposed to risks to the most degree, since they do not have any connections in the host country and have to find out all the pitfalls of legal sides and other peculiar issues while coping with arising problems all alone. Every next generation of migrants coming to countries with already existing diaspora from the same place of origin, are more protected, in sense that they may rely on advice and support of experienced migrants. Every additional migrant reduces risks and costs of potential migration for his friends or relatives, who are not yet migrants, but they are potentially more probable to become more successful migrants than those who have no interpersonal ties. Moreover, at some threshold the migration diaspora may develop up to institutionalized organizations, which helps to avoid many risks and costs for newcomers. This is the mechanism lying under the idea of how social networking can affect migration outcomes.

Fawcett (1989) formulates the hypothesis that family ties have a strong and lasting effect on migration, which is based on the assumption that obligations between family members cannot be changed by any laws and rules, and have much deeper nature taking its roots in traditions and culture. Another issue is that family members are treated among themselves as highly credible resources of information, moreover, family members usually use the common language in their everyday life, which is a necessary condition for effective communication.

Migration networks facilitate not only international migration flows development, but internal migration as well. Guilmoto and Sandron (2001) studied the temporary migration from rural to urban areas in developing countries and mentioned an importance of analysis of migration history and anthropology.

Tilly (2007) considers the question of broader social relation and talks about so-called trust networks, and specifically, about trust networks of migration, which "involves unusual amount of mutual trust", and results in obtaining the set of rights and obligations connected with being a member of such trust network. The author describes them as ordinary long-term oriented relations carrying about some common goals of some social groups (based on religious, political, etc. grounds), which imply their concentration in somewhat specialized economic and geographical spheres, compared to all others.

The previous literature exhibits a wide range of migration networks definitions, from very narrow and simple to rather aggregate and complex. For example, Massey et al. (1987) introduce migration networks as kinship, friendship, and being a fellow citizen. Orrenius (1999) considers only family network equating it to having a relative with the migration experience. Other papers look from completely different perspective and measure migration networks from the language proficiency point of view, e.g. Chiswick and Miller (1996) introduce "linguistic concentration in the area where the migrant resides" as a measure of migration networks. Munshi (2003) uses a completely different approach, measuring the migration network by the proportion of migrants living in the vicinity of an individual in the receiving country and originating from the same community in the home country. Granovetter (1995) makes a fundamental distinction between two types of social ties: strong ties (family members) and

weak ties (friends, acquaintances, etc.). Similar approach to defining what is migration network is used by Amuedo-Dorantes and Mundra (2007), who also consider separately family and friendship social ties impact.

What individual outcomes are usually considered in the literature to be affected by migration networks? One of the most popular outcomes of employment during migration experience is earnings. For example, Amuedo-Dorantes and Mundra (2007) consider the impact of social networks on earnings of Mexican migrants, during the last work trip to the US. They found that in case the network measured through family ties, earned wage on average increases for both unauthorized and legal migrants (by 2.6% and 8% respectively). The same finding is true for friendship ties, though unauthorized migrants gain more than legal migrants in this case (5.4% versus 3.6% increase). These findings are evidence of the fact that migration networks are important for Mexican migrants and play a positive role in increasing of migrants' earnings.

In this paper I will be estimating the effect of migration network for Ukrainian migrants' income for the migration wave period from 2010 to 2012, following the approach used by Amuedo-Dorantes and Mundra (2007). The definition of migration network used in my analysis is described below.

METHODOLOGY

Following the paper by Amuedo-Dorantes and Mundra (2007), who estimated the impact of migration network on the income of Mexican migrants during their last trip to the US, we will apply the same methodology for our research. However, in our case there will be several differences from Amuedo-Dorantes and Mundra (2007), dictated by the peculiarities of dataset and discussed below in more details.

In order to estimate the effect of migration network on the Ukrainian migrants' income for the period from 2010 to 2012, I will use Heckman's (1979) model, correcting for the sample selection. Other techniques, such as OLS or Ordered Probit (Ordered Logit) regressions are not applicable in our case because they result in the sample selection variable bias, according to Heckman (1979).

Here, the Heckman's model is performed in two steps by estimating consequently two separate equations. First, the respondent's decision to migrate is estimated as the probability of migration using all respondents, and second, we estimate the effect of migration network on income given the estimated probability of being a migrant. So, our model includes the following two equations to be estimated:

$$M_i = \beta_1^T X_{1i} + U_{1i}, \qquad (1)$$

$$I_i = \beta_2^T X_{2i} + U_{2i}, \qquad (2)$$

where $i = 1, ..., N$ is an index for i'th respondent. M_i is an indicator of migration (1 if respondent ever migrated abroad in 2010-2012, 0 otherwise), the predicted values of M_i constitute a latent non-observable variable $\widehat{M}_i$ whose

values can take both positive and negative numbers. We will use it further in order to correct the migration selection rule. I_i is the variable for migrant's i average monthly income; X_{1i} is the K×1 vector of variables affecting the decision to migrate. X_{2i} is the K×1 vector of variables affecting the level of migrant's income. The dummy H_i represents the outcome of corrected selection rule:

$$H_i = \begin{cases} 1 \ if \ \widehat{M}_i > 0, \\ 0 \ if \ \widehat{M}_i \leq 0. \end{cases} \tag{3}$$

Finally, the expected income is predicted by the next formula:

$$E(I_i|H_i = 1) = I_i = \beta_2^T X_{2i} + \gamma_1 \lambda_i = \beta_{2,0} + \beta_{2,1} NETWORK + \theta^T Z_{2i} + \gamma_1 \lambda_i, \tag{4}$$

where $\gamma_1 = \sigma\rho$, $\sigma = \sqrt{\text{var}(U_{2i})}$, $\sqrt{\text{var}(U_{1i})} = 1$, $\rho = \text{corr}(U_{1i}, U_{2i})$; $\lambda_i = f(\beta_1^T X_{1i})/F(\beta_1^T X_{1i})$, and $f(.)$ and $F(.)$ are, respectively, standard normal density and distribution functions. λ_i is usually called an inverse Mills ratio. (U_{1i}, U_{2i}) are bivariately normally distributed.

In equation (1), vector variable X_1 should include K those factors that usually affect the decision to migrate. Here, we will consider several assumptions made within different migration theories about the main reasons for initiation and continuation of migration as a phenomenon.

According to R. Jennissen (2007), the neoclassical economic theory assumes that the main reason for migration is wage differentials across different location points. While the dual labor theory suggests that the main pulling forces attracting foreign labor should be many opportunities for better life conditions and job employment in more developed countries: opportunity for high-skilled labor, and labor-intensive works for unskilled labor (which are usually occupied mostly by migrants). There is a wide range of other theories explaining the

migration phenomenon, but we will draw our attention on the migration network theory and communicational side of migration. Similar to Amuedo-Dorantes and Mundra (2007), we will examine a variety of demographic and family characteristics expected to be important in determining the decision to migrate. According to Bodvarsson and Van den Berg (2009), these factors are represented by the wide range of economic, demographical, sociological, political, cultural, psychological and other issues driving the migration decision. So, X_1 should include such respondents' characteristics as educational level, marital status, number of small children in the household, age, presence of some property or own business, employment status before migration experience, the current number of trips abroad (helps to understand the unknown decision of a respondent whether to return or not).

In equation (3) that predicts the final income of a migrant, there is a variable *Network*, which impact we are interested in, and another vector variable Z_{2i}, which accounts for a wide range of factors known to affect the level of migrant's earnings: work experience, age, profession type, educational level, ability to communicate in the language of the destination country, number of trips abroad before.

Our approach is somewhat different from Amuedo-Dorantes and Mundra (2007). First, we do not separate between legal and unauthorized migrants, and consider them as pooled. Second, we have no opportunity to distinguish the impact of friendship ties and impact of family ties, so we use aggregate dummy variable for *Network* described in Data section in more detail. Third, the variable for *Income* in our case will be categorical, so we will use two specifications of the second equation in Heckman's model, while the selection correction process

represented in (1) and (3) will be the same for both specifications. Let us denote these two specifications as S1 and S2, respectively.

S1. The first specification performs the Heckman's model with the second step equation representing linear relationship between modified income variable, measuring the average monthly wage for each category, and independent factors. In this case, the equation is the following:

$$Avg\ Income_i = \beta_{2,0} + \beta_{2,1}Network + \theta^T Z_{2i} + \gamma_1 \lambda_i, \qquad (5)$$

where $Avg\ Income_i$ is the average income for the category into which individual i falls, measured in USD. For the first and last categories it is equal to USD 0 and a higher limit for the K-1th category, respectively. For any intermediate category, the average income lays in the middle of the lower and higher limit of this category.

S2. The second specification uses the categorical income variable as the dependent and assumes that the second equation of Heckman's model is ordered probit regression, Here, income categories are ranked in ascending order from the lowest "0" to the highest "5" income category, totaling to six categories. For specification S2, the expected probability to fall into specific income category will be predicted by the following equation:

$$Prob(Income_i = k | H_i = 1) = F(\beta_{2,0} + \beta_{2,1}Network + \theta^T Z_{2i} + \gamma_1 \lambda_i), \qquad (6)$$

where $k = 0,1, \dots, K$ - the order number of the income category (the higher the income category, the higher is the average monthly income for this category, so the highest income is received by people from category K); λ_i is the inverse Mills ratio; $F(.)$ – cumulative distribution function of the standard normal distribution. Specification S2 is the most appropriate in terms of the approach to data types we are provided with and will be operating with.

The difference in specifications implies that the inference will also differ, and interpretation of results will be viewed from different angles for each specification. In the first specification of the Heckman's model we interpret the estimated coefficient of networking as the impact of networking in terms of changes in amount of average monthly wage compared to similar emigrants who do not use the opportunity of networking. The in the second specification the estimated coefficients only show the direction of changes, not the marginal effects of factors. Thus, after running S2 we estimate the following, in order to quantify marginal effects.

1. Average predicted probabilities to fall into the specific income category k for migrants who do not use and who use networking, separately:

$$\text{Avg Prob}(Income = k | H_i = 1, Network = 0) =$$
$$= \frac{1}{N}\sum_{i=1}^{N} \text{Prob}(Income = k | H_i = 1, Network = 0), \qquad (7)$$
$$\text{Avg Prob}(Income = k | H_i = 1, Network = 1) =$$
$$= \frac{1}{N}\sum_{i=1}^{N} \text{Prob}(Income = k | H_i = 1, Network = 1). \qquad (8)$$

2. Predicted probabilities to fall into the specific income category k for an average migrant who does not use and who uses networking, separately:

$$\text{Prob}(Income = k | H_i = 1, Network = 0, Z_2 = \overline{Z_2}, X_1 = \overline{X_1}) =$$
$$= F(\beta_{2,0} + \theta^T \overline{Z_2} + \gamma_1 \bar{\lambda}), \qquad (9)$$
$$\text{Prob}(Income = k | H_i = 1, Network = 1, Z_2 = \overline{Z_2}, X_1 = \overline{X_1}) =$$
$$= F((\beta_{2,0} + \beta_{2,1}) + \theta^T \overline{Z_2} + \gamma_1 \bar{\lambda}), \qquad (10)$$

where $\overline{Z_2}$ is the vector of average migrant's characteristics affecting the level of income, and $\bar{\lambda}$ is the inverse Mills ratio calculated at the vector of average migrant's characteristics $\overline{X_1}$ affecting the decision to migrate.

3. Average marginal effect of networking on the probability to fall into the specific income category k when a migrant starts to use networking:

$$Avg\ marginal\ effect =$$
$$= \text{Avg Prob}(Income = k | H_i = 1, Network = 1) -$$
$$- \text{Avg Prob}(Income = k | H_i = 1, Network = 0). \qquad (11)$$

4. Marginal effect of networking on the probability to fall into the specific income category k when the average migrant starts to use networking:

$$Marginal\ effect\ at\ avg =$$
$$= \text{Prob}(Income = k | H_i = 1, Network = 1, Z_2 = \overline{Z_2}, X_1 = \overline{X_1}) -$$
$$- \text{Prob}(Income = k | H_i = 1, Network = 0, Z_2 = \overline{Z_2}, X_1 = \overline{X_1}). \qquad (12)$$

After that, we compare marginal effects within the second specification, as well as general inferences of these two specifications, answering the question whether they complement each other, or whether there is a contradiction in the obtained results.

Then, we discuss which model fits the best and loses the least of information provided in the sample, in terms of Akaike's Information Criteria (AIC):

$$AIC = 2m - 2\ln(L), \qquad (13)$$

where m is the number of estimated parameters in the model, L is the maximized value of the likelihood function. The specification that minimizes the AIC is considered to be better, though this fact does not assert that the other model is inappropriate.

C h a p t e r   4

DATA DESCRIPTION

The data used in the analysis and described in this section are the migration survey conducted by the State Statistics Service of Ukraine in 2013. There are 45477 observations for Ukrainian residents, among whom 636 (1.4% from total sample) are migrants who had their last work trip abroad or were looking for a job abroad from January 2010 to June 2012. The dataset consists of the detailed information about residents' household composition, individual social, educational and work experience background before migration (if any), employment and work conditions, income level (by categories), level of expenses spent for living abroad, remittances behavior, legal issues during the migration period for those considered as migrants, etc.

4.1. Network of migration measure

In examining the effect of migrant network on income level, we need to define the variable measuring the network of migration. For this purpose, I use two questions from the survey asking respondents to define whether their friends or relatives helped them to find a job abroad, and whether friends or relatives helped to organize employment contract, working papers, etc. If at least one answer for these two questions was "yes", I put the value of *Network* variable for given respondent equal to 1, and if none of these were true, the corresponding value for *Network* was 0.

Unfortunately, the data we use do not provide us with the possibility to separate friendship and family ties in order to predict what are the effects of each of these types separately, as is done in many other papers, e.g. in Amuedo-Dorantes and Mundra (2007). That is why, we use an aggregate measure of

migration network including both possible types of ties, friendship and family: dummy variable *Network*.

As Table 4 shows, 71% of all migrants used the help of friends, relatives or both to get at least one type of help: either in looking for a job abroad, or in organizing job contract and working papers. 50 migrants (almost 8% of all migrants) were provided with both types of help from friends and/or relatives.

Table 4. Migration network dummy (for migrants)

	Obs	NETWORK	Obs	Percent
(1) Relatives/friends helped to find a job abroad	442			
(2) Relatives/friends organised job contract	57	1	449	71
Both (1) and (2)	50			
No help from relatives/friends	187	0	187	29
Total	636		636	100

4.2. Migrants' income measure

The dataset provided by the State Statistics Service of Ukraine does not include level data on migrants' income measured in the money equivalent, only distribution among several income ranges, so our variable for migrants' *Income* is categorical with 6 categories.

Among these categories, one category ("0") corresponds to "unreported income" by the reason of not willing to do so or not being informed by the employer about his (her) own income. This is considered as the worst category in our categories ranking, because it means total uncertainty about the income outcome for the migrant. Other categories are listed in increasing order, from "1" to "5". Each category with the higher order number corresponds to the higher average income level per group. Also, with increase of the category order number, the range of income levels in a given category is wider, e.g. the range

for *Income* category 2 is 250 USD, while for categories 3 and 4 are, respectively, 499 USD and 999 USD.

Another variable for the income measurement we use for our analysis in case of specification S1 is *Avg Income,* which is just the average monthly wage within given category. For the first and last categories it is equal to the limit amount (for category "0" is 0 USD, for category "1" *Avg Income* is 250 USD, for category "5" it is 2000 USD), for others it is just the median of the range. In more details variable *Income* is described in Table 5.

Table 5. Average income per month during the trip (for migrants)

	INCOME	AVG INCOME	Obs	Percent	Cumulative
Not reported	0	0	66	11	11
< USD 251	1	250	29	5	15
USD 251-500	2	375	135	21	37
USD 501-1000	3	750	268	43	79
USD 1001-2000	4	1500	117	19	98
> USD 2000	5	2000	13	2	100
Total			628	100	

Since we are going to use the two-step Heckman's model that corrects for the sample selection discussed in Methodology section, we need to examine separately two groups of dependent variables: one group affecting the person's decision to migrate (1st step of Heckman's model), another group affecting the person's falling into some specific income level range (2nd step of Heckman's model).

4.3. Decision to migrate: dependent variables

To model the person's decision to migrate, we use the next dependent variables: *Age*, *Married*, *Education* for respondent's education level, *Prior Ukr* – dummy indicating whether the person had a job or own business in Ukraine before

migration, *Number Trip* for number of foreign trips that respondent had before migration, *Urban* – dummy indicating that the respondent lived in urban areas in Ukraine (otherwise, in rural), *N_children0_6* and *N_children7_15* – the number of children in household (aged 0-6 and 7-15 years, respectively). However, our dataset does not allow for analyzing wage differentials, we draw our attention to other factors, leaving the possibility of improving the analysis by future researchers.

Prior Ukr is 1 for those respondents who had a job or own business in Ukraine before migration, it is so for 383 (60.22% of all migrants) people, while 253 people (almost 40% of all migrants) were unemployed and did not conduct any business before migration (*Prior Ukr* is 0).

To describe *Married* variable, we may say that 60% of all sample are married people, and among migrants subsample this number is close or equals to almost 63%.

The average *Age* of respondent is approximately 44 years, minimum age is 15, maximum is 70.

To describe *Number Trip* for migrants, let us look at the average number of trips abroad before the migration experience, approximately 2.5 trips. For the whole sample, the average number of trips is about 0.017. The maximum number of trips is 8.

The level of education distribution, ordered categorical variable *Education*, is described in Table 6. The first category corresponds to the highest possible level of education (complete higher), and all the following categories descend to

the lowest possible level of education (secondary or primary general). Almost 66% of all migrants completed only secondary education level.

Table 6. Education distribution for Ukrainian migrants

Level of education	EDUCATION	Obs	Percent
Complete higher	1	81	13
Base or incomplete higher	2	101	16
Complete secondary	3	421	66
Secondary or primary general	4	33	5
Total		636	100

In order to describe in what type of area (urban or rural) the respondent lived in Ukraine, we use the dummy *Urban* summarized in Table 7, below.

Table 7. Area of living in Ukraine (for migrants)

	Obs	Percentage	URBAN
Rural	381	60%	0
Urban	255	40%	1
Total	636	100%	

Another important factor of labor force participation and, consequently, the decision to migrate as well, is the number of small children in the household.

Table 8. Number of children in household (for migrants)

0-6 years old	7-15 years old			Total
	0 children	1 child	2 children	
0 children	593	16	10	619
1 child	8	3	2	13
2 children	4	0	0	4
Total	605	19	12	636

Here, we divide children in two groupes by their age: from 0 to 6 years, and from 7 to 15 years. The detailed information on number of children is presented in Table 8 above.

4.4. Modeling the migrant's income: dependent variables

For the second step of the Heckman's model, independent variables include *Network* already described in Table 4, and other factors affecting earnings level such as *Age*, *Education*, *Highskilled* – dummy for those types of professions which could be treated as requiring high skills from the worker, *Language* – variable for the respondent's ability to communicate in the language of the destination country, *Number Trip*.

The variable *Highskilled* accounting for the profession type, more accurately for high skills requirements, is described in more detail in Table 9.

Table 9. Migrants' job employment

Profession type	HIGHSKILLED	Obs	Percent
Professionals, technicians, clerks		58	9
Skilled agricultural workers	1	20	3
Skilled workers using specific tools		156	25
Services workers		105	17
Plant and machine operators	0	33	5
Elementary occupations		256	41
Total		628	100

Language variable indicating the level of destination country language proficiency for a given migrant is described in Table 10. A little more than a half (52%) communicates at the high level proficiency in the receiving country language.

Table 10. Destination country language proficiency (for migrants)

	LANGUAGE	Observations	Percent
Did not speak or understand the language	1	95	15%
Understood but did not speak	2	63	10%
Understood and spoke a little	3	147	23%
Could communicate	4	178	28%
Spoke fluently	5	153	24%
Total		636	100%

In order to compare the whole sample characteristics and migrants' characteristics, Table 11 summarizes the information on all variables used in our analysis.

Table 11. Description of variables used in the analysis

Variable	Definition	All sample (45477 obs)		Migrants (636 obs)	
		Mean	SD	Mean	SD
Age	Residents's age at the moment of survey	43,9923	15,1993	39,2028	10,7190
Married	Is 1 if married, 0 otherwise	0,6037	0,4891	0,6274	0,4839
Number trip	Number of trips abroad before the survey	0,0170	0,2209	1,2123	1,4299
Language	Ranges from 1 (lowest possible proficiency) to 5 (highest)	3,3632	1,3452	3,3632	1,3452
Highskilled	Is 1 for professions requiring high level of skills and specific knowledge, 0 otherwise	0,3726	0,4839	0,3726	0,4839
Education	Ranges from 1 (highest possible level of education) to 4 (lowest)	2,5463	0,9337	2,6384	0,7683
Prior ukr	Is 1 if the respondent had the job or own business in Ukraine at the survey moment	0,9106	0,0686	0,6022	0,4898
Gender	Is 1 for males, 0 for females	0,4572	0,4982	0,6384	0,4809
Urban	Is 1 if the respondent lived at the urban area, 0 if in rural	0,5951	0,4909	0,4009	0,4905
N_child0_6	Number of children aged 0-6 years in the household	0,0062	0,0951	0,0330	0,2111
N_child7_15	Number of children aged 7-15 years in the household	0,0211	0,1566	0,0676	0,3177
Income	Categorical: ranges from 0 (the lowest income category) to 5 (the highest)			2,6051	1,2087
Avg Income	Corresponds to average income within each category of Income			733,0812	487,9809
Network	Is 1 if friends or relatives helped a migrant to find a job abroad or to organise a job contract, visa, other documents, 0 if no help was provided			0,0786	0,2694

EMPIRICAL RESULTS

As was discussed before, in order to estimate the effect of networking on migrant's income level, we use two specifications of the two-step Heckman's model correcting for the sample selection: linear model with the sample selection for the average income (S1) and ordinal probit with the sample selection for the categorical income (S2).

5.1. Selection equation

The first step of this approach, modeling the decision to emigrate, is the selection equation, and it is the same for every specification under consideratio:

$$Migrant_i = \alpha_0 + \alpha_1 Age_i + \alpha_2 Age_i^2 + \alpha_3 Educ_i + \alpha_4 Number\ Trip_i +$$
$$+\alpha_5 Prior\ Ukr_i + \alpha_6 Married_i + \alpha_7 Gender_i + \alpha_8 Urban_i + \alpha_9 N\_child0_6 +$$
$$+\alpha_{10} N\_child7\_15_i + U_{i0}. \tag{14}$$

The estimates for this equation are provided in Table 12 and discussed below.

5.2. Income equation: two specifications

The second step is the main equation modeling the income of the migrant as a dependent of *Network* and other characteristics such as age, language proficiency level, level of education, whether the person has a high-skilled profession or not, and number of trips abroad experienced before the last migration. We use two specifications, described in the Methodology section.

S1. The first specification assumes the linear relationship between *Avg Income* and independent variables. Since the initial data for income is categorical and defining only the income range for every migrant, then we denote the average income for the migrant from category k as the average between lower and

higher income limits within one category, while for the first and the last categories it is equal to the respective higher limit and lower limit of corresponding categories (it is described in more detail in Table 5). The second step equation for Heckman model, then, is the following:

$$Avg\ Income_i = \beta_{0,1} + \beta_{1,1}Network_i + \beta_{2,1}Age_i + \beta_{3,1}Language_i +$$
$$+\beta_{4,1}Education_i + \beta_{5,1}Highskilled_i + \beta_{6,1}Number\ Trip_i + U_{i1}. \qquad (15)$$

where $\beta_{m,n}$ - coefficient of mth factor in n^{th} specification of the second equation in the Heckman's sample selection model, $m=1,\ldots,6$, $n=1,\ldots,4$. Recall, *Network* is the dummy equal to 1 if a person used some help from relatives or friends when looking for a job employment abroad or organizing migration documents. *Language* is the variable defining the destination country language proficiency for the migrant, ranges from 1 (lowest) to 4 (highest). *Highskilled* is the dummy for professions requiring high skills and specific knowledge. *Number Trip* is the number of trips abroad that the migrant had before migration, so it is assumed to describe whether there is an intention to stay in the destination country. All factor variables are described in more detail in section for Data.

S2. The second specification treats the dependent variable *Income* as the categorical variable with six categories (from 0 to 5), and applies the ordinal probit model to estimate the effect of network on income. The equation to estimate is the following:

$$Prob(Income_i = k|H_i = 1) = F(\beta_{0,2} + \beta_{1,2}Network_i + \beta_{2,2}Age_i +$$
$$+\beta_{3,2}Language_i + \beta_{4,2}Education_i + \beta_{5,2}Highskilled_i +$$
$$+\beta_{6,2}Number\ Trip_i + U_{i2}), \qquad (16)$$

where $k = 0,1,\ldots,5$ - the income category indicator. Recall that $F(.)$ is the cumulative distribution function of the standard normal distribution:

$$F(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-t^2/2}\ dt, \qquad (17)$$

The condition $H_i = 1$ means that the corrected selection rule is applied, here we use the modeled decision to migrate, not actual extracted from the data.

5.3. Coefficients estimates for selection equation

The selection equation estimates for two specifications are presented in Table 12 below. For both specifications, we have quite similar results. As we could expect, the coefficients of *Prior Ukr* is significant and negative, because those people who have a job or own business in Ukraine tend to migration less.

Another factor playing its role when a person decides whether to migrate or not is age. Here, both Age and its square term have a highly significant effect on the decision to migrate, implying that there is a threshold age up to which the impact of age on the decision to migrate is positive, and after which – the effect is negative. This threshold can be calculated as a max point of parabola determined by coefficients of Age and Age squared.

Marital status has a negative and significant effect only in case of specification S1, which sounds logical, because people having the family/spouse in Ukraine are more prone to stay with their family. But on the other hand, if the family is big, and there are children (of any age) in the family, it increases the chances of an adult to migrate in order to find a better-paid job abroad. As for gender differences, our estimates assume that males are more likely to migrate than females (according to S1 – by 15% more likely, according to S2 – by 28% more likely). Another significant factor of migration is the area where the person lives: the urban habitants are 16% (and 19%) less likely to migrate than rural habitants, according to S1 (S2, respectively). Education and number of trips abroad appeared to have insignificant effect on the decision to migrate in both

specifications. Overall, the results of the selection equation estimation are not unexpected.

Table 12. Estimates for selection equation

Specification	S1	S2
VARIABLES	Migrant	Migrant
Prior Ukr: having business or job in Ukraine	-3.366***	-3.200***
	(0.144)	(0.106)
Age of the respondent	0.109***	0.123***
	(0.0135)	(0.0111)
Age squared	-0.00133***	-0.00155***
	(0.000160)	(0.000133)
Married	-0.121**	-0.0615
	(0.0512)	(0.0414)
Gender (1 for male, 0 for female)	0.150***	0.276***
	(0.0477)	(0.0382)
Urban: is 1, if person lived in urban area, 0 if in rural	-0.157***	-0.194***
	(0.0484)	(0.0380)
N_child0_6: number of children in household between 0 and 6 years	0.459***	0.424***
	(0.117)	(0.110)
N_child7_15: number of children in household between 7 and 15 years	0.460***	0.509***
	(0.0958)	(0.0812)
Education=2, base or incomplete higher	0.0411	0.0580
	(0.0785)	(0.0638)
Education=3, complete secondary	0.0906	0.156***
	(0.0664)	(0.0532)
Education=4, secondary or primary general	-0.0738	-0.145
	(0.109)	(0.0925)
Number of trips abroad before	9.220	(omitted)
	(10,779)	
Constant	-1.479***	-1.689***
	(0.299)	(0.236)
Observations	45,469	45,469

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.4. Coefficients estimates for income equation

The estimates of the main equation for two specifications, representing the second step of Heckman model, are shown in Table 13 below. In both specifications, the coefficient of *Network* is positive and statistically significant at 10% significance level. This means that, in general, both specifications suggest that *Network* should have some positive effect on income, which answers the question posed at the very beginning.

Table 13. Income equation estimates

Specification	S1	S2
VARIABLES	Avg Income	Income
Network	119.8*	0.272*
	(69.24)	(0.158)
Age of the respondent	-4.040**	-0.00797*
	(1.818)	(0.00416)
Education=2, base or incomplete higher	-85.29	-0.184
	(70.29)	(0.159)
Education=3, complete secondary	2.203	0.00915
	(57.30)	(0.131)
Education=4, secondary or primary general	45.32	0.0722
	(98.53)	(0.225)
Number of trips abroad before	14.47	0.0346
	(17.84)	(0.0315)
Language=2, understood but did not speak	0.669	-0.0713
	(76.98)	(0.175)
Language=3, understood and spoke a little	-157.9**	-0.400***
	(63.44)	(0.145)
Language=4, could communicate	-107.3*	-0.300**
	(63.12)	(0.144)
Language=5, spoke fluently	-123.5*	-0.328**
	(63.95)	(0.147)
Highskilled =1 if the profession type of the person requires high skills and specific knowledge, 0 otherwise	230.3***	0.505***
	(40.65)	(0.0938)

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

According to S1, the estimate of *Network* coefficient is 119.8 (p-value is 0.084), so the marginal effect of *Network* on *Avg Income* is the following: ceteris paribus, the average monthly wage of migrants who use networking opportunities is on average USD 120 higher compared to the wage of similar migrants ignoring the networking opportunities. In order to quantify the effect of *Network* on income in S2, we compute average marginal effects and marginal effects at average later in this chapter. The level of education does not reveal any effect on income earned my migrants abroad. This can be explained by the corruption in educational system of Ukraine, making the presence of diploma not equal to having the corresponding specific knowledge and skills. Surprisingly, language proficiency has a negative effect on Income. However, the most economically and statistically significant factor affecting the Income is the Highskilled profession types: in both specifications, it has the highest absolute value of the coefficient and significance level <1%. Number of trips abroad does not affect the Income, according to both S1 and S2. To compare the models in terms of their fit statistics, we consider AIC. As Table 14 shows, the S2 specification is better than S1, since S2's AIC is almost twice as less as S1's AIC.

Table 14. Regressions fit statistics

Specification	S1	S2
INDICATOR	Avg Income	Income
Number of obs	45469	45469
Censored obs	44841	44841
Uncensored obs	628	628
Log-likelihood	-6150.363	-3261.846
AIC	12354.73	6581.692
Rho	-0.008308	-0.0070403
(SE)	(0.0398371)	(0.0380244)
chi-square(1)*	0.04	0.03
P-value	0.8348	0.8531

* Likelihood-ratio test of independence of selection and income equations (H0: Rho=0) suggests to reject the null in both cases.

5.5. Predicted probabilities for S2

As Table 15 shows, the change from Network = 0 to 1, given specific Income category, decreases both *Avg Prob* and *Prob at Avg* to fall into the higher income category for Income categories 0, 1 and 2 (for migrants from low income categories). While at the same time, for high Income categories 3, 4 and 5, it increases both types of probabilities to fall into the higher income category (or the same, increases the chance not to fall into the lower income category).

Table 15. Predicted probabilities to fall into specific Income category for S2

	Avg Prob		Prob at Avg		
	Network = 0	Network = 1	Network = 0	Network = 1	Obs
Income = 0	0.106***	0.0655***	0.0961***	0.0575***	628
	(0.0170)	(0.0227)	(0.0165)	(0.0211)	
Income = 1	0.0446***	0.0321***	0.0438***	0.0305***	628
	(0.00876)	(0.00938)	(0.00878)	(0.00946)	
Income = 2	0.215***	0.175***	0.219***	0.175***	628
	(0.0188)	(0.0292)	(0.0198)	(0.0314)	
income = 3	0.433***	0.445***	0.449***	0.462***	628
	(0.0207)	(0.0202)	(0.0217)	(0.0211)	
Income = 4	0.182***	0.247***	0.176***	0.245***	628
	(0.0215)	(0.0453)	(0.0222)	(0.0482)	
Income = 5	0.0197***	0.0360**	0.0156***	0.0299**	628
	(0.00620)	(0.0152)	(0.00536)	(0.0138)	

Standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

It can be explained by the following idea. People, who are supposed to get higher income (and consequently, to fall into Income category 3, 4 or 5), are usually more skilled and talented. So, they are more prone to use their networking in a proper way extracting the maximum of the utility they could and using all possible advantages, which may result in the finding the best paid jobs they could ever find given all their skills and network opportunities. While people from the low income groups (category 0, 1 and 2) are usually less skilled

and less knowledgeable, so they may miss the opportunities that can be found through the networks or even to choose the wrong ones. So, here it is the possibility of endogeneity issue to arise. It may come from the possible positive relationship between the ability of migrants to earn more and the ability to connect with migration networks. In the presence of endogeneity, the effects of Networks for low-income groups would be biased downward.

5.6. Marginal effects for S2

Finally, the Table 16 presents the average marginal effects and the marginal effects at average of *Network* on *Income* for specification S2.

Table 16. Marginal effects of Network on Income for S2

	Avg Marginal Effect	Marginal Effect at Avg	Obs
Income = 0	-0.0468*	-0.0451*	628
	(0.0273)	(0.0262)	
Income = 1	-0.0131*	-0.0141*	628
	(0.00791)	(0.00853)	
Income = 2	-0.0372*	-0.0418*	628
	(0.0220)	(0.0249)	
income = 3	0.0227	0.0253	628
	(0.0146)	(0.0164)	
Income = 4	0.0613*	0.0646*	628
	(0.0358)	(0.0381)	
Income = 5	0.0131	0.0112	628
	(0.00862)	(0.00737)	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

After computing two types of marginal effects, we still have very similar results in terms of directions of effects and their statistical significance. In general, for lower income groups (Income = 0, 1 and 2) there is a statistically significant at 10% level negative effect of Network on Income. But as was supposed above, it can be due to endogeneity issues. For upper income groups (Income = 3, 4 and

5) we can observe only positive marginal effects of both types, though they are significant at 10% level only in case of Income = 4. P-values for average marginal effect and marginal effect at average for Income = 3 are respectively 0.12 and 0.123. And p-values for average marginal effect and marginal effect at average for Income = 5 are respectively 0.127 and 0.13.

The interpretation of marginal effects would be as follows. For example, the average marginal effect of Network on Income for Income = 2 is equal to -0.0372. It means that, on average, Ukrainian emigrants who fall into income category 2 and use networking opportunities are less likely to get into Income category 3 (or the same, are more likely to get into Income category 1) by 3.72% compared to the similar emigrants who do not use networking opportunities when looking for a job abroad.

The marginal average effect of Network on Income for Income = 4 is equal to 0.0646, and it implies the following interpretation. The average emigrant falling into Income category 4 is, on average, 6.46% more likely to get into higher Income category 5 (or equivalently, is 6.46% less likely to get into the lower Income category 3) if he uses networking opportunities when looking for a job abroad than the similar average migrant who does not use networks.

Chapter 6

CONCLUSIONS

This paper investigates the impact of migration networks on income of Ukrainian emigrants, for the sample of 45477 observations on Ukrainian residents over the time period of 2010-2012. Here, migration network is defined as the family and friendship connections that help the migrant to find a job abroad and/or to organize working contract, visa and other documents. And Ukrainian emigrants are defined as those Ukrainian residents working or looking for a job abroad in 2010-2012.

In order to make the analysis, I follow the methodology suggested by Amuedo-Dorantes and Mundra (2007), who estimate the effect of the impact of migration networks on migrants' income for Mexican emigrants to the US with the help of Heckman' model that corrects for the sample selection bias. However, I use two specifications of Heckman model instead of one linear: I use linear and ordinal probit models. The obtained empirical results are as follows. Migration networks have different effect on different income groups of emigrants, in terms of probabilities to fall into higher income group. For lower income groups this effect is significant and negative (and it varies from -4.68% to -1.31%), for higher income groups it is positive (varies from 1.12% to 6.46%), but not for all high income groups it is significant. In terms of change in average monthly wage of emigrant, networking on average is associated with about USD 120 increase in wage.

The better and more accurate results may be obtained with better data that include not categorical, but level data on average monthly income earned by Ukrainian emigrants while working abroad. The information on migration

networks which distinguishes between family and friendship ties will allow to estimate the separate effects of each of them. Another missing, though quite important information in terms of determining the migration flow directions is wage differential across countries. Nevertheless, the results obtained in this work only partially support the author's initial hypothesis about the positive impact of migration network on Ukrainian migrants' income.

The proposed set of tools in case of positive network impacts includes the creation and support of an organized government agency, which would manage social migration network issues, provide informational support to its members, allow to self-organize communication between migration network members, etc.

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