

**DETERMINANTS AND THEIR ROLE IN EMIGRATION
PROCESS: NEURAL NETWORK AND CLUSTER
ANALYSIS**

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ABSTRACT

Peoples are migrating due to the worldwide current economic condition. The purpose of this study is also to investigate those factors that become the reason of emigration and have social economic impact on emigrant's family members. Consider factors are education, poverty, high crime rate, social status, unemployment and motivation have been nominated as factors for emigration. The study region is the Gujrat district, Pakistan and respondents selected by cluster sampling technique. Confirmatory factor analysis support that all factors are significance as a whole. In neural network analysis results categorizes the family members of emigrant as the most important variable followed by level of education of emigrant and poverty. Cluster Analysis shows that Motivation, Social Status and Poverty are the main operating factors that play significant role in migration of majority people from one to another place. The conclusion is also that the living conditions of the Emigrant's family particularly improved.

Key words: Emigration, Neural Network, Cluster Analysis, Pakistan

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1. INTRODUCTION

In last couple of year, a considerable number of people have migrated from one place to another place for better opportunities including education, job, social status etc. Emigration has been regarded as a burning issue in Pakistan. Emigration is defined as permanently leaving one's country or region to settle in another country or region. Another Common term used for the human migration is immigration but both the perspectives have different contextual meanings. National Geographic society (2005) referred that when people move from one place to another temporally it is called 'Emigration' and when people move from one place to another place permanently it is termed as 'immigration'. There are two types of Migration. First is known as Internal Migration in which people move within one state, country or continent .Second is known as External Migration in which people move from one state to different state, country or continent.

Peterson (1958) suggested two important types of Migration. According to him some persons migrate as a mean of achieving new favorable conditions which may be called innovative migration. Some migrate in response to a change in conditions; in order to maintain what they have, they normally move geographically to continue residing in conditions that match with their requirements in all aspects; this may be called as conservative migration. Migration within the same country does not really affect the economical conditions of the country. However, external migration may affect the economic condition of that country in wide range. But in both cases, the migration affects the conditions of the emigrating family.

The impact of Emigration on the receiving country has established a great agreement of attention as compared to the transferring country. Remittances have proven the positive and important contribution in the economical conditions of the countries that receive remittances. When Emigrants send their money back to their home, the standards of living of emigrant's family becomes high that also influential contribution in nation's trade stability. Now a days, a large number of people are attempting to leave the devastating country because of the current globalization trends and opportunities. Herberle (1938) explain "Push and Pull" theory. Some push and pull factors affect the human Emigration. Push factors are the reasons that compel people to leave an area and Pull factors encourage and attract them to reside in that area.

There are number of possible factors that can affect the Emigration. An important factor which pushes a person to migrate is to get higher education or insufficient facilities of education in that

area. Nausheen and Mariam (2006) stated that majority of migrant have arranged household tutors for their children. This is because the schools are neither well-staffed nor located at suitable distances. Kothari (2002) also stated that the Education can breakdown the intergenerational spread of poverty. Deshingkar and Start (2003) find that the children's education is associated to the consequence of their Emigration.

In present conditions it becomes more difficult to manage one's bread and butter. Not only the uneducated people but also the highly educated persons are being deprived of their jobs. Unemployment also has a great influence on the Emigration. Unemployment is due to lack of job, improper education, industrial crises. Unstable political circumstances, energy and economic crises have left fewer opportunities of jobs in industries because of which people are attempting to leave their residences for better opportunities. Pakistan is over populated country coupled with unemployment, poverty and increased inflation rate. Pakistan's economy has benefited a great deal from foreign exchange remitted by its Emigrants as they have sent to their families that constitute a total of around 70 billions USD from 1970 to 2007 according to the state bank of Pakistan (2009).

The key reason of poverty is unemployment, the higher the unemployment the greater the poverty. Due to present severe global crises, the rich become richer and poor become poorer. This situation leads to increasing frustration among the masses to gain more wealth not only to keep them alive but to lead a balanced life. The only earning hand of a family has great willingness to migrate to another country to get better opportunity. In some cases the conditions of poverty may be a source of Emigration. Kothari (2002) stated that thus poverty is a residual of Emigration. Rauf (1988) indicated that about half respondents mentioned that previously their normal diet was limited to vegetables because they could not afford better food. After the migrated, the food in their household has changed and they have started eating meat, poultry and eggs quite frequently.

The increasing crime rate has an enormous influence on the Emigration. The improperly fulfillment of the basic needs of a person is the main reason of increased crime rate. In Gujrat City most of the surrounding villages or towns are those in which one dispute becomes the matter of family pride and becomes their family dispute which remains continuous from generation to generation. To avoid such condition as well as to save the lives of their loved ones, family also pushes that person to migrate to other country. Mears (2001) theory also points the

probability that children of Emigrants may be more possible to involve in crime and some people migrate due to the arising conflicts. Homer-Dixon (1991) and Homer-Dixon (1994) stated that Emigration is generally considered to be the intermediate stage which links environmental degradation and disasters to conflict.

The changing trends and advancement also inspires people to raise their status. People want to get power and prestige in society and a financially secured future with high standards of living, this also “push” people to migrate. Arif (1997) exposed that the Effect of payments on both the financial position and the social position of the sampled families is significant. Osili (2004) argues that migrants often maintain economic and social ties to their original communities similarly remittances play very important role to increase social status of Emigrants as well as of their families.

Motivation is a sort of desire for Emigration. Motivation is an important factor that at the same time pushes and pulls the person to foreign countries, such as to get nationality, to marry someone, inspired by someone or charming society or good climate.

Gazdar (2003) stated that in 1980, nearly two million Pakistanis had migrated from here. The economic crisis has just hit every country and it is global problem but as compared to any other country the ratio of Emigration in Pakistan is much higher. Unemployment, poverty, education are the common problems which effects everyone not only in Pakistan but on global level. A student does not concentration on their studies because they were grown up with understanding that their secure future is in foreign countries. Esipova and Ray (2009) Around 700 million adults would like to migrate to another state permanently if they get the chance. That is the reason they adopt both illegal and legal ways to reach there. The present critical condition of Pakistan and current globalization of the foreign countries forces people to leave their own country. According to Times of Pakistan (2011), “Public Order Minister Christos Papoutsis said more than 100,000 people had arrived Greece illegally last year”. According to Federal Investigation Agency (FIA), Pakistan, “Federal investigating agency has arrested 1779 people who were involved in human trafficking in the year 2010”. Major factors are explored in this study, which really affect the Emigration and also check the impact of the Emigration on Emigrants families only in Gujrat City. It may be helpful for policy makers and other officials of public and private sector to have an insight in this issue. This study tends to highlights the main causes which make Gujrat a place from where a very large amount of people are or have been

migrated? Not only the people of Gujrat but people from different cities preferred to migrate from this area. The research objectives are:

1. Explore the factor those become the reasons of Emigration in the target area.
2. Evaluate the significance level for each variable and for all factors.
3. Estimate the Impact after Emigration on the selected regions.

2. LITERATURE REVIEW

The reviewed literature from the past studies conducted in different countries about the controversial issue of Emigration, showed different Factors that are the causes of the Emigration need theoretical justifications and literature support from the past studies. Khan et al. (2012) argued that the main reason for Emigration is motivation. The results tell us that family members and close relatives were the main source of motivation for emigration from Kharian to Norway while the data also predicts that majority of the emigrants' close relatives living back in Pakistan aspire to visit Norway. Zhang and Song (2003). Examine those factors behind the Emigration with the help of time-series and cross-section data. The results shows that rural–urban Emigration helped out the Chinese urban population evolution, while moving together with the Chinese economy, the causal link runs from economic progress to migration, inter province Emigrants were encouraged by the rural–urban income gap and dispirited by their geographic distances to ends and the amount of intra province migrants is positively related to rural–urban income gap and urban population in that area. Haris and Gazdar (2003) highlighted that according to 1998 census, some 10 million people, or 8% of the population of Pakistan has involved in internal or international migrants. They explained flow was equivalent to 10% of GNP. Currently, remittances are US\$2.4 billion. Farooq, et al. (2005) examines the Data of census-1998 and reported that 50% of the respondents migrated due to economic reasons, 80% and 13% of the respondents were 'pushed' out of their place of origin due to poor economic and educational opportunities, respectively. These findings are consistent with the Todaro model. Irfan et al. (1983) has conducted as study based on the 1980 Population, Labor Force and Migration Survey and determine that Emigration is predominantly from rural to urban areas. Barrett et al. (2009) has employed Regression analysis to measure whether the average wages of citizens across skill cells is affected by the share of immigrants across by cell. When the cells are based on experience, these self-contradictory results propose that care should be exercised when

applying this method as in correct impressions of the impact of immigration on wages may arise in that area. Khatak (2004) uses the 1998 census to explore migration in KPK (Khyber Pakhtunkhwa). A large number of people migrate from Khyber Pakhtunkhwa (KPK) to Punjab. The majority of migrants in KPK moved from other areas within the province were young and migrated for non-economic reasons (with family or spouse). Only 8.4% migrated for business purposes. Wadsworth (2010) has used the Census and Uniform Crime Report data and run the Ordinary least squares regression models to measure the cross-sectional relationship between emigration patterns and rates of crime. The cross-sectional time-series models were employed to define how changes in emigration prejudiced variations in crime or robbery rates between 1990 and 2000. The results show that there is complex relationship between emigration and crime and suggest that development of emigration may have been responsible for part of the quick crime drop of the 1990s. Khan et al. (2009) discussed that emigration plays an important role in the household economy of the emigrant family. According to his study 24.3% people are receiving remittances from abroad. It has significant effects on the lives of the families of the emigrants to receive revolution and advance their livelihood. Kothari (2002) described the method to scan the characteristics of those who move and those who stay, the procedures by which they are required from adopting migration as a livelihood plan and the conditions under which migration tolerates chronic poverty an opportunity to move out of poverty.

3. SURVEY METHODOLOGY

The population of this study is consisted of all those people who move abroad from the Gujrat City. This study finds important factors that mainly contributed in the Emigration in Gujrat City. Cluster sampling technique (probability sampling technique) has been applied in this study, because it is used when natural grouping is done in population. Two-stage Cluster sampling is used, all the colonies of Gujrat city is consider as first stage cluster. In which we randomly selected six clusters as Shadman, Younas Abad, and Marghzar colony, Khalid Abad, Muslim Abad and Madina Syedan. At second stage we select those houses as cluster in which one family member is living in abroad using again two stage cluster sampling technique. And finally 50 respondents have been selected (sample) from each slected colony. Therefore, the total sample size of this study is 300. Questionnaire was employed as a main instrument in this study to collect the data .The questionnaire consists of two parts First part of questionnaire was about

demographic information (age, gender, education etc.) and second part contains factors (Education, Unemployment, poverty, high crime rate, social status, motivation and impact of the Emigration) studied through literature consisted of 52 questions on a 5 point Likert scale.

Descriptive statistics are carried out for all items involved in this study. Confirmatory factor analysis is used to confirm the factors. Neural Network Analysis and Two-Step Cluster Analysis are used to fulfill the main objectives of the study. The cluster analysis is an exploratory data analysis tool aims at sorting different objects into groups in a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise. The major types of clustering are Hierarchical cluster analysis, k-means cluster, and two-step cluster, and in this study two-step cluster analysis is used. It provides a simple profile of individuals and also suggests how groups of units are determined such that units within groups are similar in some respect and unlike those from other groups.

4. RESULTS AND DISCUSSION

In order to observe the Impact of contributing factors on the Emigrant's family, the results of descriptive statistics are calculated for all variables but results of some of the important variables are discussed here. These results provide simple summaries about the sample and the measures.

4.1 Descriptive Analysis:

Descriptive statistics provides a simple quantitative summary for data set. It is used to express main types of data. Each variable have their total number, Maximum, Minimum, Mean and Standard Deviation values. The age of the respondents is maximum 65 year and minimum 19 years. Mean value is 33.40 and standard deviation is 10.639. Similarly Maximum income after the Emigration of the respondents is 80000 and the Minimum is 0 with mean and standard deviation is 140505.00 and 119286.504 same as Maximum income before the Emigration 650000 and Minimum is 0 with mean and standard deviation is 12976.67 and 14175.5992. Description of nominal variables includes, 88% respondents are male and 12% respondents are female, 43.3 % respondents are single and 56.7% respondents are unmarried, 54.3% belongs to nuclear family and 45.7% respondents belong to joint family system and the last 9% respondents belong to middle level of education, 29% belong to metric, 24% to intermediate, 25.3% to bachelor, 11% to master and only 1.3% belong to M.Phil. The result show that, male is

comparatively greater than female who move to abroad. Percentage of unmarried person is greater than married person. Similarly percentage of nuclear family is more than joint family who leave their county.

4.2 Factors which are necessary for study:

Firstly, factors are chosen from the reviewed literature that can influence on the Emigration. These factors are Education, Unemployment, Poverty, High Crime Rate, Social Status and Motivation. Confirmatory factor analysis has been applied for conformation of these factors. All selected variables in each factor are confirmed. Most factors are meeting the criteria of conformation, as shown in Table 4.1. This results show that this factors is reliable for further analysis.

Table 4.1 Measures of Goodness of Fit Criteria's of all the Factors:

Recommended Factors	χ^2	d.f	P.Value	$\chi^2/d.f$	GFI	AGFI	RMSEA
Minimum Criteria				≤ 5	$\geq .90$	$\geq .90$	$\leq .08$
1.Education	13.705	2	0.001	6.8525	0.978	0.891	0.138
2. Unemployment	26.746	9	0.002	2.971	0.969	0.928	0.085
3. Poverty	19.615	9	0.020	2.179	0.978	0.949	0.064
4. High crime Rate	53.871	5	0.000	10.774	0.928	0.784	0.188
5. Social Status	0.530	2	0.767	0.265	0.999	0.996	0.000
6. Motivation	21.731	14	0.014	1.552	0.980	0.961	0.041
7.Impact of Emigration	515.929	152	0.000	3.394	0.834	0.792	0.095

4.3 Classification Matrix:

In Classification Matrix of Neural Network that 111 out of 113 cases of the category “No” of dependent variable in training samples are correctly classified, making a 98.2 % correctly classified. And 139 out of 141 cases in category “Yes” of dependent variable in training samples are correctly classified, making a 98.6% correctly classified is shown in result. Overall 98.4% cases in training samples are correctly classified. In holdout samples 13 out of 23 cases in category “No” of dependent variable is correctly classified, making a 56.5 % correctly classified. And 16 out of 25 cases in category “Yes” of dependent variable in holdout samples are correctly classified, making a 69.6% correctly classified. Overall 63.0% cases in holdout samples are correctly classified. This classification results show that almost all the variables entered in the model has the ability to distinguish the impact of the Emigration in the emigrant’s family in the form of “No” and “Yes”.

Table 94.2 Classification Matrix of Neural Network:

Sample	Observed	Predicted		
		No	Yes	Percent Correct
Training	No	111	2	98.2%
	Yes	2	139	98.6%
	Overall Percent	44.5%	55.5%	98.4%
Holdout	No	13	10	56.5%
	Yes	7	16	69.6%
	Overall Percent	43.5%	56.5%	63.0%

4.4 Estimate the Impact of Emigration:

The Input layer has nine independent variables and 1 factor which have 4 categories, by using Neural network analysis estimate the impact of Emigration on Emigrant’s family. Output layer uses softmax activation function. Hidden layer is used to assign the weighted to the input layers to predict the output layer which is our dependent variable have 2 categories No and Yes. There are seven Hidden layer and two output layers are used to for the prediction. By using Hidden layer and output layer, predict the probability of No and Yes “Impact of Emigration on the Emigrant’s families”. Here we randomly selected one respondent’s information and calculate the probability of the No and Yes Impact of Emigration. The result shows that probability of No is 0.000000001076 and probability of Yes is 0.9999999829. Here concluded that the probability of Yes is larger which shows that there are significant impacts on Emigrant’s family.

Activation Function of Output Layers:

$$\text{Softmax} = \gamma(y_k) = \frac{\exp(y_k)}{\sum_j \exp(y_j)}$$

$$\text{No Impact} = \gamma(y_8) = 0.00000001076$$

$$\text{Yes Impact} = \gamma(y_9) = 0.9999999829$$

4.5 Factors which are important for prediction:

The contribution of predictors is explaining importance of independent variables to predicting category of dependent variable. The graphical presentation of normalized importance shows that Motivation 100% most important variable to predicted model on bases of dependent variable. Similarly next is Social status 97.7%. Results show that all independent variables are

important to prediction of model on the bases of dependent variable, because the differences between the independent variables are the not wider.

Table 4.3 Contribution of Predictors:

Independent Variable Importance		
	Importance	Normalized Importance
Education level of the Emigrant	.096	76.1%
Education	.071	56.1%
Unemployment	.105	83.6%
Poverty	.092	73.3%
High crime rate	.103	82.1%
Social Status	.123	97.7%
Motivation	.126	100.0%
Income before Emigration	.095	75.5%
Income after Emigration	.098	78.1%
No of family members of Emigrant	.090	71.6%

4.6 Determination of characteristics of each group:

Two step cluster analysis is used for identifying groups of individuals, whose characteristics are similar to each other. Two-step cluster analysis, explore that which factors is playing a significant role in cluster of No and Yes impact of Emigration on emigrant's family. There are four criterion of Clustering, which is Schwarz's Bayesian Criterion (BIC) second is BIC Change third is Ratio of BIC Changes and fourth is Ratio of Distance Measures. In this situation, the cluster solution is smaller value of BIC, which 1254.514 on cluster 4. The value of the BIC change is -16.666 on clusters four which shows that four clusters are selected. But Best solution will have a reasonably large Ratio of the BIC changes lie in the cluster 2 and the large Ratio of Distance Measures lies in the cluster 2. So it is clear that 2 clusters are selected according to data.

The Centroids which is indicates that clusters separated by continuous variables. Education factor have the mean value in cluster 1 is 7.5279 and in cluster 2 is 8.4024. Next unemployment factor have the mean value in cluster 1 is 17.9645 and in cluster 2 is 20.7083. As compare of cluster 1, mean values of all variables are high in Cluster 2. So impact of Emigration is Yes in cluster 2. Because Cluster 1 shows that No impact and Cluster 2 show that Yes impact of emigration.

The Result Two-step Cluster Analysis show that Social status playing a most significant role for the prediction “No” and “Yes” Impact of Emigration. Conclusion is that Social Status, Motivation, Poverty and Unemployment, these factors playing an important role for achievement of high Impact of Emigration in Emigrants family and high crime rate and Education play as insignificance role for the Impact of Emigration in Emigrants family.

4.6.1 Factor-wise Importance:

The "by variable" importance chart for first cluster is shown in Fig. 4.1. The variables on the Y axis are in descending order of importance. The dashed vertical lines mark the critical values for determining the significance of each variable. For a variable has to be consider significant, its t-statistic must be exceed the dashed line in either a positive or negative direction. Negative t-statistic indicates that the variable generally takes smaller than average values within this cluster while a positive t-statistic indicates the variable takes larger than average values. If all the variables are exceed the critical value in the chart. So it is conclude that all of the continuous variables contribute to the formation of the cluster. In Cluster 1 all of the factors take smaller than average value and first four factors like Social status, Motivation, poverty, Unemployment are important to the formation of this cluster. It also indicates that for Cluster 1, all the variables takes smaller than average values. These results confirm the trends observed by the Centroids results.

TwoStep Cluster Number = 1

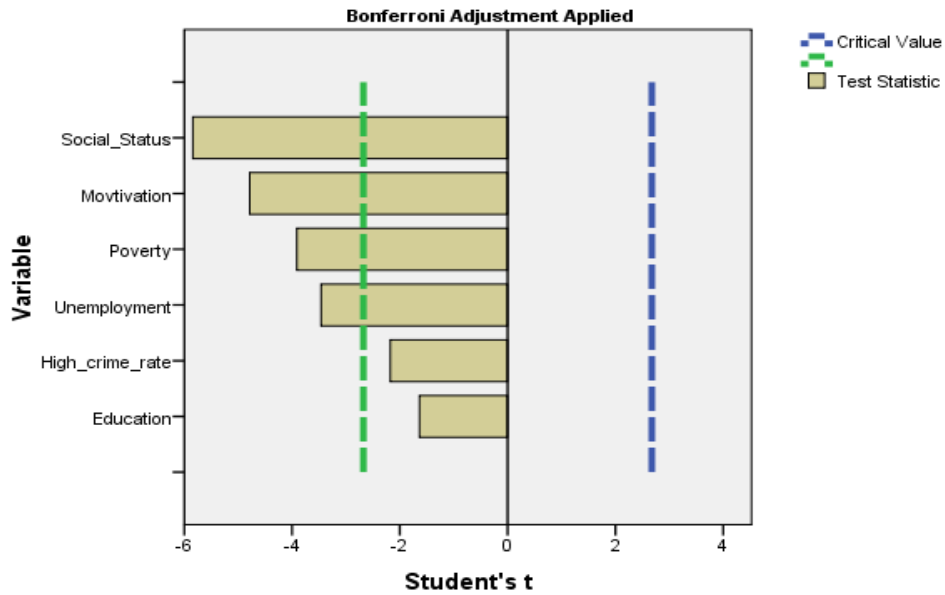


Fig.4.1: By-variable importance chart for cluster no. 1

TwoStep Cluster Number = 2

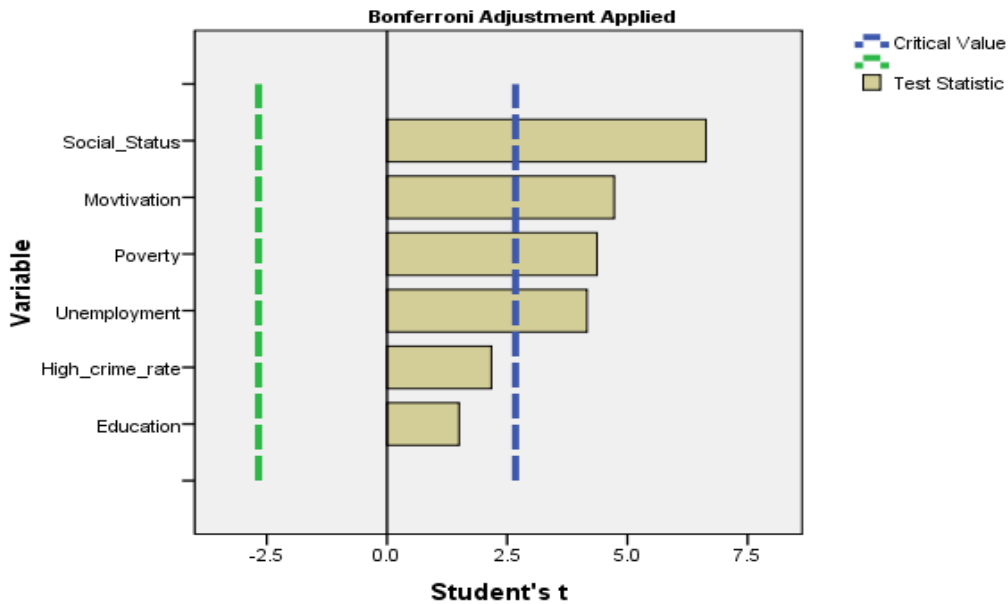


Fig.4.2: By-variable importance chart for cluster no. 2

The "by variable" importance chart for 2nd cluster is shown in Fig. 4.2. The variables on the Y axis are in descending order of importance. All of the factors take larger than average value and first four factors like Social status, Motivation, poverty, Unemployment are important to the formation. The highest bar in cluster 2 is the Social Status that supported in the Impact of the Emigration in the Emigrates family. It also indicates that for Cluster 2, all the variables takes larger than average values. These results confirm the trends observed by the Centroids results.

4.7 Conclusion:

The study examined the fundamental factors which affects persons to move to another area. Finding show that male is comparatively greater than female who move to abroad. Result of confirmatory factor analysis shows that all variables are significance in each construction. A model is estimated for the impact of Emigration by using Neural Network, which shows that most important predictors is the Motivation and Social status and also calculate the probability No and Yes Impact of Emigration on Emigrant's family. Probability results show that Yes impact of Emigrant's family after migrates. Cluster analysis shows that Social status and motivation are important factors which push a person to migrate. Two clusters are made by using Two Step Cluster Analysis, first cluster contains the characteristics "No" impact of Emigration on Emigrant's family. Second cluster consist the characteristics "Yes" impact of Emigration on Emigrant's family. Cluster analysis shows Yes impact of Emigration on emigrant's family.

4.8 Limitations of the Study

Due to financial and time constraints, instead of whole Gujrat city only 6 colonies are selected. Only those respondents are included in study whose family member was pushed to migrate. The restricted time frame does not allow us to use a large sample which is required for the reliability of the survey, generalizing findings and making inferences from a sample about the population. The large number of population and study conducted in other cities and nationalities will further enhance the generalization of the study.

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