The Impact of Mothers Migration for Work Abroad on Children's Education in Sri Lanka

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ABSTRACT

Regardless of the economic benefit migration seams to provide, the absence of a mother could be expected to have a critical impact on the child's education and the future as she plays a vital role in child care. This research aimed to determine whether a mother's migration for work abroad impacts the education level of the child and to identify the factors affecting their education. The research was conducted during 2012 among Sri Lankan school children in Gampaha district. Stepwise Ordinal Logistic Regression was performed to evaluate the factors that were related to the average examination marks. Fitted models reveal that 'mother migrated children' has a strong relationship with the lower levels of examination results. Attendance, mother's reason for migration and gender were identified as the factors associated with the education level of the 'mother migrated children'. Therefore presence and the involvement of the mother is important for better educational performances.

Keywords: Mother Migration, Ordinal Logistic Regression, Children's education, School attendance, Impact, Child care.

1. INTRODUCTION

Migration can be defined as men's and women's solution to the plight of family poverty and unemployment. According to the Sri Lanka Bureau of Foreign Employment (Annual Statistical Report, 2010) the female departure for foreign employments has been increased over time.

It is estimated that at present around 600,000 women have migrated for work abroad, most of them semi-skilled, unskilled or housemaids. It is also estimated that around 75% of these women are married and that 90% of these mothers have children left behind. Approximately, an average Sri Lankan family size is calculated at 2.5 children. Therefore around one million children are left behind by migrating mothers (Integrated Development Consultants (Pvt) Ltd. on behalf of Save the Children, 2005).

However, regardless of the economic benefit migration seams to provide, the absence of the mother could be expected to have a critical impact on the child's education and the future as they play a vital role in child care.

Through this research it has been determined whether the mother's migration for work abroad impacts the education level of the child and identifies the factors affecting their education. Most of the researches done on the children of foreign employed mothers were mainly focused on the emotional, psychological, and social impact on children and families. There were few studies have touched on the impact on children's education and most of them are not interested in fitting a statistical model. Therefore it is our duty to identify and analyse these issues and provide the policy makers with the necessary information they need to improve the wellbeing of children of migrants.

2. METHODOLOGY

2.1 Sample design

The study was conducted in Gampaha District, Kelaniya District Secretariats Division, Sri Lanka. Where Gampaha District is the second highest for female foreign departures according to the Sri Lanka Bureau of Foreign Employment. The study was focused on selecting a representative sample of students from the mixed schools in Kelaniya. In order to obtain end of year examination marks for same subjects, only the children from grade 6 to grade 11 were considered. The data were collected by direct interviews with both students and the class teachers. Therefore children from grade 1 to 5 were eliminated due to the practical limitations with obtaining correct information. Therefore the sample size for 'mother migrated' students were 108. A control sample of 108 was also selected from children of 'mother not migrated'. By selecting equal number of students from each school the control sample was collected. To select students from each grade stratified sampling was used.

2.2 Questionnaire

The questionnaire had three main sections namely demographics of child and the parents, information regarding the mother migration and educational details. The first part was focused on the socio demographic features and the characteristics of the parents and the child. The second part of the questionnaire assessed the information regarding the mother migration and after effects. The third part was focused on educational details of the child including school attendance and end of year examination marks on five main subjects namely Sinhala, English, Science, Mathematics and Religion. End of year examination marks and the attendance were collected from the school records.

The average examination marks were divided into four ordered levels (Integrated Development Consultants (Pvt) Ltd. on behalf of Save the Children, 2005) and taken as the dependent variable. To identify the associated independent variables Stepwise Ordinal Logistic Regression was used. For model selection, Stepwise method was used. Statistical Analysis System (SAS) 9.2 was used for model fitting. The statistical significance and difference were considered at 0.05. Two models were fitted. First for both 'mother migrated' and 'mother not migrated' children to identify whether the migration effects the education and the second for 'mother migrated' children to identify the factors effect for their education. Odds ratios were calculated to identify the relationship between the categories of examination results and the categories of independent variables.

2.3 Logistic Regression

In statistics, logistic regression is a type of regression analysis used for predicting the outcome of a categorical dependent variable (a dependent variable that can take on a limited number of categories) based on one or more predictor variables. The probabilities describing the possible outcome of a single trial are modeled, as a function of explanatory variables, using a logistic function. Logistic regression measures the relationship between a categorical dependent variable and a independent variable (or several) of any type, by converting the dependent variable to probability scores.

Logistic regression can be binomial or multinomial. Binomial (or Binary) logistic regression is a form of regression which is used when the dependent is a dichotomy and the independent of any type. Multinomial logistic regression refers to the case where the dependant variable can have three or more possible types. When multiple classes of a multinomial dependent variable can be ranked then ordinal logistic regression is proffered. Continuous variables are not used as dependent variables in logistic regression.

Logistic regression can be used to predict a dependent variable on the basis of continuous or categorical independent variables and to determine the effect size of the independent variables on the dependent, to rank the relative importance of independents. The impact of predictor variables is usually explained in terms of odds ratio.

2.3.1 Ordinal Logistic Regression

For ordinal response models, the response Y takes on one of k+1 possible values, denoted by 1, 2, ..., k, k+1, and there is an inherent ordering in the response values. The value of k is usually small. Suppose $\boldsymbol{x}$ is a vector of explanatory variables and

$$p_i = \Pr(Y \leq i|x)$$

Then the analysis fits the model

$$logit\ (p_i) = \ Log\ \frac{\Pr(Y \leq i|x)}{\Pr(Y > i|x)} = \propto \ + X^{'}b$$

$$logit\ (p_i) = \propto_i + \ b_{i1}X_1 + \ \ldots\ldots\ldots\ldots + b_{jm}X_m$$

where j = 1,…….,k and i = 1,….,k and

$\propto_1$, $\propto_2$, ……., $\propto_k$ are intercept parameters and b is a vector of slope parameters. This is a parallel lines regression model based on the cumulative probabilities of the response categories, also known as the proportional odds model. The logit model is called a cumulative logit.

2.5 Odds Ratio

$\varphi = \exp(b)$= The log odds ratio for the independent variable. The odds ratio is a measure of effect size, describing the strength of association or non-independence between two values. It is used as a descriptive

statistic, and plays an important role in logistic regression. The odds ratio treats the two variables being compared symmetrically.

2.6 Stepwise Selection Procedure

A step by step method is to determine a logistic regression equation that begins with a single independent variable and adds or deletes independent variables one by one based on the likelihood ratio or score statistic. Variables are added to the logistic regression equation one at a time, using the statistical criterion of reducing the -2 Log Likelihood errors for the included variables.

After each variable is entered, each of the included variables is tested to see if the model would be better off the variable were excluded.

The process of adding more variables stop when all of the available variables have been included or when it is not possible to make a statistically significant reduction in -2 Log Likelihood using any of the variables not yet included.

2.7 Proportional Odds Assumption

This is the Chi-Square Score Test for the Proportional Odds Assumption. Since the ordered logit model estimates one equation over all levels of the dependant variables. The test for proportional odds tests whether our one equation model is valid. If we have to reject the null hypothesis, we would conclude that ordered logit coefficients are not equal across the levels of the outcome and we would fit less restrictive model. If we fail to reject the null hypothesis, we conclude that the assumption holds. SAS uses Score Test to check the assumption of proportional odds assumption.

The Proportional Odds Assumption is:

H_0 : Slope coefficients in the model are the same across response category.

H_1 : Slope coefficients in the model are not same across response category.

2.8 Model Fitting Information

In SAS AIC (Akaike Information Criteria) and SC (Schwarz Criteria) tests are used to access the model fit. In both methods the model with the smallest criterion statistic is considered as the best.

Intercept Only: This column refers to the respective criterion statistics with no predictors.

Intercept and Covariates: This column corresponds to the respective criterion statistics for the fitted model. A fitted model includes all independent variables and the intercept. We can compare the values in this column with the criteria corresponding Intercept Only value to assess model fit/significance.

2.9 Deviance and Pearson Goodness-of-Fit Statistics

This contains Pearson's Chi-Square statistic for the model and another chi-square statistic based in the deviance. These statistics are intended to test whether the observed data are inconsistent with the fitted model.

2.10 Type 3 Analysis Effects

The type 3 test of effects table provides Wald Chi-Square Statistics. A Wald test is used to test the statistical significance of each coefficient in the model. A Wald test calculates a Z statistic, which is:

This z value is then squared, $z - \frac{\hat{B}}{SE}$ yielding a Wald statistic with a chi-square distribution.

2.11 Residual Chi-Square Test

This is a Score Test to evaluate the goodness of fit. This criterion is based on the relationship of the residuals of the model with other potential explanatory variables. If an association exists, then the additional explanatory variable should also be included in the model. This test is distributed as chi-square, with degrees of freedom equal to the difference in the number of parameters in the original model and the number of parameters in the expanded model.

3. RESULTS AND DISCUSSION

(1) From the last semester examination marks for the subjects Sinhala, Science, Mathematics, English and Religion the average examination mark for each child was calculated. After that the average mark was categorized in to 4 ordered levels as follows:

1. Average Marks between 0 to 25
2. Average Marks between 26 to 50
3. Average Marks between 51 to 75
4. Average Marks between 76 to 100

3.1 Factors Associated with the education level of both 'mother migrated' and 'mother not migrated' children.

To identify the factors which significantly affect the education level of both 'mother migrated' and 'mother not migrated' children, a number of suspicious factors were used as input variables for the analysis. Those input variables were Gender, Ethnicity, Religion, whether the child lives in his/her own House, Employment Level of Father, Employment Level of Mother, Average Monthly Family Income, Participation for Extra Classes, Participation in Extracurricular Activities, Attendance, Education Level of Mother, Education Level of Father, Age, Number of Children in the Family, Category of Mother (whether the mother migrated or not) and Participation in Sports.

The results of the ordinary logistic regression analysis suggested that five factors significantly affect the education level of both 'mother migrated' and 'mother not migrated' children at 5% level of significance. Those factors were Attendance, Category of Mother, Ethnicity, Participation in Extra Classes and Education Level of the Mother. Attendance and the Category of Mother are the most significant variables. (Table 3.1.1)
Let's take

p_1 = Pr (Average Marks 0-25)
p_2 = Pr (Average Marks 26-50)
p_3 = Pr (Average Marks 51-75)
p_4 = Pr (Average Marks 76-100)

Since there are four levels (k=3 in ordered logistic regression) in the response variable there are three equations for the model. Hence the three equations for the model can be obtained as follows:

Equation 1

Average Marks 0-25 versus Average Marks 26-50 and Average Marks 51-75 and Average Marks 76-100.

$\text{Log}\left(p_1 / (p_2 + p_3 + p_4)\right)$ =
0.0232 - 0.9966 ETHNICITY(Muslim) + 1.5415 M_EDU(No School Education)
-1.5904 M_EDU(Up to GCE A/L or Above) + 0.6843 M_CATEGORY(Migrated) + 0.3858 EXTRA_CLASS(No) - 1.3315 ATTEN(150-200)

Equation 2

Average Marks 0-25 and Average Marks 26-50 versus Average Marks 51-75 and Average Marks 76-100.

Log ($p_1 + p_2$) / ($p_3 + p_4$) =

2.2352 - 0.9966 ETHNICITY(Muslim) + 1.5415 M_EDU(No School Education)

- 1.5904 M_EDU(Up to GCE A/L or Above) + 0.6843 M_CATEGORY(Migrated) + 0.3858 EXTRA_CLASS(No) - 1.3315 ATTEN(150-200)

Equation 3

Average Marks 0-25 and Average Marks 26-50 and Average Marks 51-75 versus Average Marks 76-100

Log ($p_1 + p_2 + p_3$) / p_4) =

4.6739 - 0.9966 ETHNICITY(Muslim) + 1.5415 M_EDU(No School Education) - 1.5904 M_EDU(Up to GCE A/L or Above) + 0.6843 M_CATEGORY(Migrated) + 0.3858 EXTRA_CLASS(No) - 1.3315 ATTEN(150-200)

Since the p-value (0.6202) of the score test is greater than 0.05 there is no enough evidence to reject the null hypothesis. Therefore the proportional assumption holds. Hence slope coefficients in the model are the same across response category.

(Table 3.1.2)

Both AIC and SC tests, the criterion statistics of Intercept and Covariates are less than the Intercept Only. Therefore the best fitted model is the model with both intercepts and covariates. (Table 3.1.3)

The significance values of both Deviance and Pearson criterion are greater than 0.05. Hence the data and the model predictions are similar and that we have a good model. (Table 3.1.4)

The Wald Chi-Square Statistics indicate that all four variables are clearly significant at the 5% significance. (Table 3.1.5)

Since the p-value is 0.8908 at 5% significance level, there is no enough evidence to reject the null hypothesis. Hence the main effects model fits adequately and no additional interactions need to be added. (Table 3.1.6)

By analyzing the odds ratios the following results were obtained:

The odds of being in the lower levels of examination results compared to being in the higher levels of examination results when mother migrated compared to mother not migrated is 3.930 times high. Hence the 'mother migrated' children have poor educational performance compared to the 'mother not migrated' children.

3.2 Factors Associated with the education level of 'mother migrated' children.

To identify the factors which significantly affect the education level of 'mother migrated' children, a number of suspicious factors were used as input variables for the analysis. Those input variables were gender, ethnicity, religion, whether the child lives in his/her own house, employment level of father, employment level of mother, average monthly family income, participation for extra classes, participation in extracurricular activities, attendance, education level of mother, education level of father, age, number of children in the family, Category of Mother (whether the mother migrated or not), participation in sports, Reason for migration (whether to provide a good education for children or other reason), Age of the child

when mother was migrating, Guardian of the child, satisfaction about the guardian, communication system with mother and frequency of communication.

The results of the ordinary logistic regression analysis suggested that three factors significantly affect the education level of 'mother migrated' children at 5% level of significance. Those factors were Attendance, Reason for Migration and Gender. The three equations of the model are as follows:

Equation 1

Average Marks 0-25 versus Average Marks 26-50 and Average Marks 51-75 and Average Marks 76-100.

Log (p_1 / ($p_2 + p_3 + p_4$) =

0.1441 - 0.4769 GENDER(Female) + 0.7019 REASON_EDU(No) - 1.6498 ATTEN(150-200)

Equation 2

Average Marks 0-25 and Average Marks 26-50 versus Average Marks 51-75 and Average Marks 76-100.

Log ($p_1 + p_2$) / ($p_3 + p_4$) =

2.6034 - 0.4769 GENDER(Female) + 0.7019 REASON_EDU(No) - 1.6498 ATTEN(150-200)

Equation 3

Average Marks 0-25 and Average Marks 26-50 and Average Marks 51-75 versus Average Marks 76-100.

Log ($p_1 + p_2 + p_3$) / p_4) =

4.3775 - 0.4769 GENDER(Female) + 0.7019 REASON_EDU(No) - 1.6498 ATTEN(150-200)

Since the p-value (0.1941) of the score test is greater than 0.05 there is no enough evidence to reject the null hypothesis. Therefore the proportional assumption holds. Hence slope coefficients in the model are the same across response category.
(Table 3.2.2)
Both AIC and SC tests, the criterion statistics of Intercept and Covariates are less than the Intercept Only. Therefore the best fitted model is the model with both intercepts and covariates. (Table 3.2.3)
The significance values of both Deviance and Pearson criterion are greater than 0.05. Hence the data and the model predictions are similar and that we have a good model. (Table 3.2.4)
The Wald Chi-Square Statistics indicate that all four variables are clearly significant at the 5% significance. (Table 3.2.5)
Since the p-value is 0.4777 at 5% significance level, there is no enough evidence to reject the null hypothesis. Hence the main effects model fits adequately and no additional interactions need to be added. (Table 3.2.6)

By analyzing the odds ratios the following results were obtained:
The odds of being in the lower levels of examination results compared to being in the higher levels of examination results when the reason for migration is other reason (not to provide better education) compared to reason for migration is to provide better education is 4.071 times higher. Therefore the children of mothers those who have migrated with some other intension (for example, to built a house, to escape from problems, to overcome financial difficulties and etc.) other than to provide a better education for their children have poor educational performances.

The odds of being in the level 0-25 compared to being in the 26-50 or 51-75 or 76-100 when attendance in 100-150 days compared to less than 100 days is 0.373 times lower. The odds of being in the level 0-25 compared to being in the 26-50 or 51-75 or 76-100 when attendance in 150-200 days compared to less than 100 days is 0.051 times lower. Therefore 'mother migrated' children with higher attendance have good educational performance.

The odds of being in the lower levels of examination results compared to being in the higher levels of examination results when the gender is female compared to the gender is male is 0.385 times lower.

4. CONCLUSION

The results of the ordinary logistic regression analysis suggested that out of those many possible factors, five factors significantly affect educational level of both 'mother migrated' and 'mother not migrated' children at 5% level of significance. Out of them category of mother (Migrated or not) was one of the most significant factors where 'mother migrated' children do not perform well in education. It can be concluded that the absence of the mother negatively affects the educational performance of the child. Therefore the presence and the involvement of the mother is important for better educational performance. Hence special attention should be put on 'mother migrates' children from schools, caregivers and the government.

5. REFERENCES

(2) Integrated Development Consultants (Pvt) Ltd. on behalf of Save the Children, (2005), *LEFT BEHIND, LEFT OUT, The Impact on Children and Families of Mother Migrating for Work Abroad.*

(3) Sri Lanka Bureau of Foreign Employment, (2010), *Annual Statistical Report of Foreign Employment.*

(4) Institute for Digital Research and Education, *SAS Annotated Output Ordered Logistic Regression.* [Online] Available: http://www.ats.ucla. edu/stat/sas/output /sas_ologit_output.htm

(5) A. Agresti, (2002), *Categorical data analysis.* (2nd ed)**.** John Wiley& sons.

6. TABLES

Table 3.1.1: Summary of Stepwise Selection

Summary of Stepwise Selection

Step	Effect Entered	Removed	DF	Number In	Score Chi-Square	Pr > ChiSq
1	ATTENDEN		2	1	34.2693	<.0001
2	M_CATEGORY		1	2	19.8301	<.0001
3	ETHNICITY		2	3	14.3329	0.0008
4	EXTRA_CLASS		1	4	9.3020	0.0023
5	M_EDU		4	5	12.1755	0.0161

Table 3.1.2: Proportional Odds Assumption
Score Test for the Proportional Odds Assumption

Chi-Square	DF	Pr > ChiSq
17.5013	20	0.6202

Table 3.1.3: Model Fitting Information

Model Fit Statistics

Criterion	Intercept Only	Intercept and Covariates
AIC	558.610	479.937
SC	568.735	523.816
-2 Log L	552.610	453.937

Table 3.1.4: Deviance and Pearson Goodness-of-Fit Statistics
Deviance and Pearson Goodness-of-Fit Statistics

Criterion	Value	DF	Value/DF	Pr > ChiSq
Deviance	453.9373	635	0.7149	1.0000
Pearson	666.2401	635	1.0492	0.1891

Table 3.1.5: Type 3 Analysis Effects
Type 3 Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
ETHNICITY	2	10.4569	0.0054
M_EDU	4	13.7285	0.0082
M_CATEGORY	1	22.8899	<.0001
EXTRA_CLASS	1	6.8900	0.0087

Table 3.1.6: Residual Chi-Square Test
Residual Chi-Square Test

Chi-Square	DF	Pr > ChiSq
10.2937	17	0.8908

Table 3.2.1: Summary of Stepwise Selection

Summary of Stepwise Selection

Step	Effect Entered	Removed	DF	Number In	Score Chi-Square	Pr > ChiSq
1	ATTENDEN		2	1	20.1626	<.0001
2	REASON_EDU		1	2	11.2082	0.0008
3	GENDER		1	3	5.8415	0.0157

Table 3.2.2: Proportional Odds Assumption

Score Test for the Proportional Odds Assumption

Chi-Square	DF	Pr > ChiSq
11.1363	8	0.1941

Table 3.2.3: Model Fitting Information

Model Fit Statistics

Criterion	Intercept Only	Intercept and Covariates
AIC	261.517	229.166
SC	269.564	247.941
-2 Log L	255.517	215.166

Table 3.2.4: Deviance and Pearson Goodness-of-Fit Statistics

Deviance and Pearson Goodness-of-Fit Statistics

Criterion	Value	DF	Value/DF	Pr > ChiSq
Deviance	215.1665	317	0.6788	1.0000
Pearson	274.5444	317	0.8661	0.9592

Table 3.2.5: Type 3 Analysis Effects

Type 3 Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
GENDER	1	5.7364	0.0166
REASON_EDU	1	11.6456	0.0006
ATTENDEN	2	20.0093	<.0001

Table 3.2.6: Residual Chi-Square Test

Residual Chi-Square Test

Chi-Square	DF	Pr > ChiSq
32.7869	33	0.4777