CHAPTER 5

MULTIVARIATE ANALYSES OF FACTORS AFFECTING REMITTANCES

5.1 INTRODUCTION

Remittances are affected by a multitude of factors, which are in turn inter-related in a complex manner. As shown earlier, remittances received by heads of household vary across age, gender, marital status and educational level. In this chapter, appropriate multivariate techniques will be used to analyze the independent effects and combined effects of the inter-correlated variables on remittances, and to determine which one of these is most important in explaining the variations in remittances. Logistic regression will be used to analyze the dichotomous dependent variables on the proportion of heads of households who had received remittances. ANOVA will be used to test the differences in the amount of remittances (transformed into natural logarithm) across categories of the independent variables. Multiple classification analyses (MCA) will be used to assess the importance of each independent variable in terms of deviations from the grand mean and the beta weights in the multivariate context. Multiple regression techniques will be used to build models for the prediction of the amount of remittances.

5.2 MULTIVARIATE ANALYSES OF THE PROPORTION OF HEADS OF HOUSEHOLDS WHO HAD RECEIVED REMITTANCES

In this section, two models of logistic regression will be assessed. The first model, excludes the variable "the number of migrant children" while the second model includes the variable "number of children" (see Table 5.1). Given the very strong correlation between remittances and the number of migrant children, the separate runs were made to assess the net effects of the other variables if all households had the same number of migrant children.

Table 5.1 : Dummy variables to be used in logistic regression on the likelihood of households receiving remittances and the corresponding reference categories

Dummy variables	Reference category
Age	66 years old or older
Gender	Male
Marital status	Married
Education	Secondary and above
Activity status	Non agriculture worker
Household size	5 person and above
Number of migrant children	5 person and above
Household income	RM1400 and above

The fitted logistic regression model can be used to obtain the value of p_i, that is the probability of heads of household receiving remittances, as follow:

$$\ln [p_i/(1 - p_i)] = \hat{\beta}_o + \sum_{j=1}^{r} \hat{\beta}_j x_{ij}$$

and then solving for p_i (Jobsen,1992). The value of p_i is given by

$$p_i = \frac{e^{\delta}}{1+e^{\delta}} \qquad \text{where } \delta = \hat{\beta}_o + \sum_{j=1}^{r} \hat{\beta}_j x_{ij}$$

The results of the first model are summarized in Table 5.2 – 5.4. Table 5.2 shows the observed and predicted number of households according to whether they had received remittances from migrant children during the last one year. The logistic regression model predicted 75.49 percent of the cases correctly. The model chi-square is a likelihood ratio test that reflects the difference between error not knowing the independents (initial chi-square) and error when the independents are included in the model (deviance). The Chi-square value of 336.940 with 14 degree of freedom shows that the inclusion of these independent variables would improve significantly the prediction of the value of the dependent variable.

Table 5.2 : Model 1 : Classification table on the actual and predicted number of households that had received remittances during the 12 months preceding the survey

Actual	Predicted		
	Not received	Received	Percent Correct
Not received	338	132	71.91
Received	118	432	78.55
	Overall		75.49

$\chi^2 = 336.940(df = 14)$

The goodness of fit of the model is 1018.668 (see Table 5.3), and the model fits the data well at 0.05 level. Based on the R square value (Jobsen, 1992), the model explains about 37.6 percent of the variance in the proportion of households receiving remittances.

Table 5.3 : Model 1 : Goodness of fit test for logistic regression on the probability of receiving remittances

-2 Log Likelihood	1070.799
Goodness of fit	1018.668
Nagelkerkel's R square	0.376

Owing to the confounding effects of the variables, the proportion of households receiving remittances in the multivariate context may show a reversal from the patterns observed in bivariate analyses. The results of Wald statistics in Table 5.4 show that only four of the variables being studied (age, education, activity status of heads of household and household size) are significant in explaining the likelihood of heads of household receiving remittances. Within the multivariate context, the probability of households receiving remittances was highest among household heads who were aged 56- 65, followed by those aged 66 and above, and lowest among those aged 55 and below. Heads of household with primary schooling would have the highest probability of receiving remittances, followed by those with no schooling, and those with at least secondary schooling. Household heads who were not working would be more likely to receive remittances, followed by those who worked in the agriculture sector and those who worked in the non-agriculture sector. The likelihood of receiving remittances is negatively related to the household size, ceteris paribus.

The non-significant variables are gender, marital status and total household income. Female heads of household were more likely than their male counterparts to receive remittances from their migrant children. Currently married heads of household

had a higher probability to receive remittances as compared to those who were not married. In general, higher income households would be more likely to receive remittances as compared to poorer households, ceteris paribus.

Table 5.4 : Model 1 : Logistic regression analysis on the likelihood of heads of household receiving remittances from their children with seven selected variables

Variable	Coefficient β	Standard error	Wald statistics	Significance level	Exp (β)
Constant	-1.0944	0.3313	10.9122	0.0010**	
Age					
55 years old and below	-1.0055	0.2275	19.5306	0.0000**	0.3659
56 – 65 years old	0.3365	0.2396	1.9718	0.1603	1.4000
Gender					
Female	0.5557	0.3589	2.3978	0.1215	1.7432
Marital status					
Non married	-0.5518	0.3411	2.6167	0.1057	0.5759
Education					
No schooling	0.8880	0.295	9.0615	0.0026**	2.4303
Primary	1.1778	0.2174	29.3376	0.0000**	3.2471
Activity status					
Not working	1.2917	0.2604	24.6056	0.0000**	3.6388
Agriculture worker	0.4433	0.1947	5.1818	0.0228*	1.5579
Household size					
1 - 2 person	1.0941	0.2507	19.041	0.0000**	2.9864
3 - 4 person	0.6936	0.1731	16.0615	0.0001**	2.0010
Total household income					
RM350 and below	-0.3948	0.2672	2.1827	0.1396	0.6738
RM351 – 700	-0.3214	0.2236	2.0675	0.1505	0.7251
RM701 – 1050	0.1387	0.2336	0.3528	0.5525	1.1488
RM1051 – 1400	-0.0296	0.2582	0.0131	0.9088	0.9708

Model χ^2 = 336.940
Degrees of freedom = 14
Number of cases = 1020

* $p < 0.05$ ** $p < 0.01$

Table 5.5 shows that the inclusion of "number of migrant children" variable improves the percentage of cases correctly predicted to 84.31 percent. The proportion of

variance in the dependent variable that can be explained by the model has increased to 69.7 percent (see Table 5.6).

Table 5.5 : Model 2 : Classification table on the actual and predicted number of households that had received remittances during the 12 months preceding the survey

Actual	Predicted		
	Not received	Received	Percent Correct
Not received	345	125	73.40
Received	35	515	93.64
	Overall		84.31

$\chi^2 = 752.227$ (df = 17)

Table 5.6 : Model 2 : Goodness of fit test for logistic regression on the probability of receiving remittances

-2 Log Likelihood	655.513
Goodness of fit	954.358
Nagelkerkel's R square	0.697

Controlling for the number of migrant children would reverse some of the findings of the previous model. The younger heads of households would be more likely than the older ones to receive remittances, indicating that the observed lower probability of younger heads receiving remittances is largely due to the fact that they had fewer migrant children. Heads of household who were not working were more likely to receive remittances, while those who worked in non-agriculture workers were least likely to receive remittances, the same as in Model 1. The smaller the household size, the greater would be the likelihood of heads of household receiving remittances. As expected, the

likelihood of heads of household receiving remittances increases significantly with the number of migrant children. The non-significant explanatory variables are : gender, marital status, education, and total household income.

Table 5.7 : Model 2 : Logistic regression analysis of the likelihood of heads of household receiving remittances on characteristics of the heads of household

Variable	Coefficient β	Standard error	Wald statistics	Significance level	Exp (β)
Constant	0.6546	0.4668	1.966	0.1609	
Age					
55 years old and below	0.7398	0.3180	5.4110	0.0200*	2.0956
56 – 65 years old	0.5061	0.2874	3.1007	0.0783	1.6589
Gender					
Female	-0.2453	0.5773	0.1805	0.6709	0.7825
Marital status					
Non married	0.1808	0.5684	0.1012	0.7504	1.1982
Education					
No schooling	0.1495	0.4015	0.1386	0.7096	1.1613
Primary	0.4047	0.3064	1.7447	0.1865	1.4988
Activity status					
Not working	1.2929	0.3436	14.1580	0.0002**	3.6434
Agriculture worker	0.2612	0.2575	1.0287	0.3105	1.2984
Household size					
1 - 2 person	0.7156	0.3241	4.8766	0.0272*	2.0455
3 - 4 person	0.4205	0.2319	3.2878	0.0698	1.5228
Number of migrant children[#]					
None	-7.8741	1.0434	56.9528	0.0000**	0.0004
1 - 2 person	-1.9759	0.2983	43.8807	0.0000**	0.1386
3 - 4 person	-0.9474	0.2775	11.6533	0.0006**	0.3878
Total household income					
RM350 and below	-0.0977	0.3361	0.0845	0.7712	0.9069
RM351 – 700	-0.067	0.2859	0.0548	0.8148	0.9352
RM701 – 1050	0.1814	0.3040	0.3558	0.5508	1.1988
RM1051 – 1400	0.4629	0.3589	1.6640	0.1971	1.5887

Model χ^2 = 752.227
Degrees of freedom = 17
Number of cases = 1020

* $p < 0.05$ ** $p < 0.01$

[#] Note that households with no migrant children were included in the analysis to retain the sample size.

5.3 ANALYSIS OF VARIANCE ON THE REMITTANCES RECEIVED BY HEADS OF HOUSEHOLD

The analysis of variance decomposes the total variations of the dependent variable into two components--between group differences and within group differences. The technique is used to test the existence of significant differences across sub-groups.

As alluded to in Chapter 4, the amount of remittances received by heads of household is not normally distributed, and as such the amount of remittances received, the dependent variable, is transformed into natural logarithm before running the analysis. The histogram and normal curve in Figure A.4, the stem and leaf in Figure A.5 and the P-P plot in Figure A.6 in Appendix III show that the transformed data is approximately normally distributed.

Analysis of variance on natural logarithm of the amount of remittances received by heads of household was performed on age, gender, marital status, education, activity status of the heads of household, as well as household size, number of migrant children and total household income. The model explains 23.6 percent of the variance of the amount of remittances received (in natural logarithm). Table 5.8 shows that gender, marital status of the heads of households and household size do not have statistically significant relationships with the natural logarithm of the amount of remittances. Hence they would be excluded from further analysis.

Table 5.8 : Analysis of variance of natural logarithm of the amount of remittances received by heads of household

Sources of Variation	Hierarchical Method				
	Sum of Squares	DF	Mean Square	F-test	Significance
Main effects	182.865	16	11.429	10.297	0.000
Age	20.902	2	10.451	9.416	0.000
Gender	0.407	1	0.407	0.367	0.545
Marital status	0.722	1	0.722	0.650	0.420
Education	11.816	2	5.908	5.323	0.005
Activity status	20.263	2	10.131	9.128	0.000
Household size	4.495	2	2.247	2.025	0.133
Number of migrant children	49.665	2	24.833	22.373	0.000
Total household income	74.596	4	18.649	16.802	0.000
Summary					
Explained	182.865	16	11.429	10.297	0.000
Residual	590.483	532	1.110		
Total	773.348	548	1.411		

R-squared = 0.236

The model with 5 variables (age, education, activity status, number of migrant children and total household income) together with their two-way interaction terms explained 22.8 percent of the variance in the variance of the natural logarithm of the amount of remittances (see Table 5.9). The education level of the heads of household was found to have a strong interactive effect with age and total household income ($p < 0.025$) in explaining the logarithm of the amount of remittances, and will be excluded from the subsequent model (see Table 5.10).

Table 5.9 : Analysis of variance of natural logarithm of the amount of remittances received by heads of household with five selected variables

Source of Variation	Hierarchical Method				
	Sum of Squares	DF	Mean Square	F-test	Significance
Main effects	176.607	12	14.717	13.920	0.000
Age	20.902	2	10.451	9.885	0.000
Education	12.207	2	60.104	5.773	0.003
Activity status	20.142	2	10.071	9.525	0.000
Number of migrant children	50.108	2	25.054	23.697	0.000
Total household income	73.247	4	18.312	17.320	0.000
Two-way interaction	89.245	56	1.594	1.507	0.013
Age * Education	15.887	4	3.972	3.756	0.005
Age * Activity status	3.889	4	0.972	0.919	0.452
Age * Number of migrant children	8.203	4	2.051	1.940	0.103
Age * Total household income	9.903	8	1.238	1.171	0.315
Education * Activity status	4.012	4	1.003	0.949	0.436
Education * Number of migrant children	5.445	4	1.361	1.287	0.274
Education * Total household income	19.411	8	2.426	2.295	0.020
Activity status * Number of migrant children	10.583	4	2.646	2.502	0.042
Activity status * Total household income	6.806	8	0.851	0.805	0.599
Number of migrant children * Total household income	17.322	8	2.165	2.048	0.039
Summary					
Explained	265.852	68	3.910	3.698	0.000
Residual	507.496	480	1.057		
Total	773.348	548	1.411		

R-squared = 0.228

Table 5.10 shows that all the four selected explanatory variables have statistically significant effects on the natural logarithm of the amount of remittances received by heads of household ($p < 0.01$). The model explains 22.0 percent of the variance in natural logarithm of the amount of remittances. The two-way interactions for the four selected variables are not statistically significant and as such MCA would be the appropriate appropriate technique for analyzing the natural logarithm of the amount of remittances

received by heads of household within the multivariate context (Andrews, Morgan, Sonquist and Klem; 1973).

Table 5.10 : Analysis of variance of the natural logarithm of the amount of remittances received by heads of household in the four selected variables

Source of Variation	Hierarchical Method				
	Sum of Squares	DF	Mean Square	F-test	Significance
Main effects	169.999	10	17.000	15.398	0.000
Age	20.902	2	10.451	9.466	0.000
Activity status	20.165	2	10.082	90.132	0.000
Number of migrant children	49.136	2	24.568	22.253	0.000
Total household income	79.797	4	19.949	18.080	0.000
Two-way interaction	49.137	36	1.365	1.236	0.167
Age * Activity status	4.020	4	1.005	0.910	0.458
Age * Number of migrant children	8.667	4	2.167	1.963	0.099
Age * Total household income	6.900	8	0.863	0.781	0.619
Activity status * Number of migrant children	8.311	4	2.078	1.882	0.112
Activity status * Total household income	10.174	8	1.272	1.152	0.327
Number of migrant children * Total household income	14.405	8	1.801	1.631	0.113
Summary					
Explained	219.136	46	4.764	4.315	0.000
Residual	554.212	502	1.104		
Total	773.348	548	1.411		

R-squared = 0.220

5.4 MULTIPLE CLASSIFICATION ANALYSIS (MCA) OF THE AMOUNT OF REMITTANCES RECEIVED BY HEADS OF HOUSEHOLD

The amount of remittances received by heads of household is a function of a multitude of factors. Multivariate analyses are performed to examine the combined effects of some of the pertinent variables, and to assess the independent effects of each of these factors. As transformation of the original data to satisfy the assumption of normality can be used in MCA, natural logarithm of the amount of remittances is used as the dependent variable in this analysis.

Table 5.11 shows the results of MCA with four explanatory variables. The eta values show the zero-order correlation between the amount of remittances received by heads of household and the independent variables with several categories. The beta values show the relative importance of each explanatory variable net of the effects of other variables in the model. Of the four variables in the model, total household income is the most important explanatory variable, followed by the number of migrant children, age and activity status of the heads of households. The effects of total household income remain very significant even after controlling for all other variables in the model, with the largest beta coefficient (0.34), followed by number of migrant children (0.30), activity status (0.19) and age (0.10).

Table 5.11 : Multiple Classification Analysis (MCA) of natural logarithm of the amount of remittances received by heads of household by selected variables

Grand Mean = 7.22

Variable		Deviation from grand mean			
	n	Unadjusted	Eta	Adjusted	Beta
Age			0.16		0.10
55 or younger	172	-0.26		-0.05	
56 - 65	196	0.22		0.16	
66 or older	181	0.01		-0.12	
Activity status			0.15		0.19
Not working	230	0.15		0.22	
Agriculture worker	239	-0.20		-0.26	
Non-agriculture worker	80	0.17		0.14	
Number of migrant children			0.28		0.30
1 – 2	108	-0.55		-0.61	
3 –4	177	-0.12		-0.10	
5 or more	264	0.30		0.32	
Total household income			0.29		0.34
Up to RM350	121	-0.46		-0.59	
RM351 – 700	137	-0.10		-0.07	
RM701 – 1050	113	0.06		0.07	
RM1051 – 1400	68	-0.05		0.05	
More than RM1401	110	0.59		0.63	

Multiple R Squared= 0.220
Multiple R = 0.469

To examine the gross and net differentials in the amount of remittances received by heads of household, the anti-logarithms of the figures in Table 5.11 are shown in Table 5.12 to facilitate interpretation of the data. At the bivariate level, the amount of remittances received increases with age up to age of 65. This same pattern can also be observed after controlling for activity status, number of migrant children and total household income. The amount of remittances received by heads of household aged 55 or younger would be about RM1,299.84 after adjusting for other variables. On the other hand, the mean amount of remittances received would be about RM1,603.59 for those aged 56 - 65 and RM1,211.97 for those aged 66 and older, ceteris paribus.

Table 5.12 : Multiple Classification Analysis (MCA) of the amount of remittances received by heads of household (converted from natural log) by selected variables

Grand mean = RM1,366.49

Variable	Deviation from grand mean				
	n	Unadjusted	Eta	Adjusted	Beta
Age			0.16		0.10
55 years old or younger	172	-312.86		-66.65	
56 - 65 years old	196	336.26		237.10	
66 years old or older	181	13.73		-154.52	
Activity status			0.15		0.19
Not working	230	221.14		336.26	
Agriculture worker	239	-247.70		-312.86	
Non-agriculture worker	80	253.22		205.35	
Number of migrant children			0.28		0.30
1 – 2	108	-578.09		-624.01	
3 –4	177	-154.52		-130.04	
5 or more	264	478.08		515.34	
Total household income			0.29		0.34
Up to RM350	121	-503.85		-609.01	
RM351 – 700	137	-130.04		-92.38	
RM701 – 1050	113	84.50		99.08	
RM1051 – 1400	68	-66.64		70.06	
More than RM1401	110	1,098.64		1,199.25	

Multiple R Square = 0.220
Multiple R = 0.469

Before adjusting for other variables, household heads who worked in agriculture sector received the smallest amount of remittances, followed by those who were not working and those who were engaged in non-agriculture sector. After controlling for other variables, the amount of remittances received would still be lowest among workers in the agriculture sector, but it would be highest among heads of household who were not working.

The mean amount of remittances is strongly and positively correlated with number of migrant children in a household. A household with five or more migrant

children received about RM1,056.17 more than a household with only one to two migrant children. Adjusting for other variables in the model would increase the differentials in the amount of remittances to RM1,139.35.

In the preceding analysis, total household income was found to have a rather small effects on the probability of households receiving remittances. However, total household income produces the most pronounced effect on the amount of remittances received by household heads within the multivariate context, as shown by the relative size of the beta value. At the bivariate level, the mean amount of remittances received was found to range from RM862.64 for households with the lowest income to RM2,465.13 for households with the highest income. Controlling for age, activity status and number of migrant children increases the differentials across the income categories.

5.5 MULTIPLE REGRESSION OF REMITTANCES RECEIVED BY HEADS OF HOUSEHOLD

Ordinary Least Squares regression using dummy variables is performed to estimate the net effects of the predictor variables on natural logarithm of the amount of remittances received by household heads. The predictors that are entered into regression model include education and activity status of the heads of household, household size, number of migrant children and total household income. These predictor variables explained 22.3 per cent of the variation in the natural logarithm of the amount of remittances received. Other variables such as age, gender and marital status are not included as they do not have statistically significant relationship with the natural logarithm of the amount of remittances, or would pose problems of multicollinearity. The histogram and P-P plot of regression standardized residual (see Figure A.7 and A.8 in Appendix IV) show that the error (disturbance) term is approximately normally distributed. Table 5.13 shows the selected explanatory variables and their respective reference categories to be used in regression analysis.

Table 5.13 : Dummy variables to be used in regression analysis on the amount of remittances received and the corresponding reference categories

Dummy variables	Reference category
Education	No schooling
Activity status	Not working
Household size	1 - 2 person
Number of migrant children	1 - 2 person
Total household income	Up to RM350

Table 5.14 shows that total household income is the most important factor affecting the amount of remittances received, followed by number of migrant children, activity status, education of the heads of household and finally household size. These results are consistent with that of the MCA. The estimated equation is as follow:

ln(remittances) = 6.149 + 0.195(primary) + 0.539(secondary and above) - 0.441(agricultural) - 0.134(nonagricultural) - 0.0349(3-4 household members) - 0.258(5 or more household members) + 0.501(3-4 migrant children) + 0.919(5 or more migrant children) + 0.496(RM351-700) + 0.639(RM701-1050) + 0.716(RM1051-1400) + 1.297(More than RM1400)

To obtain the estimated amount of remittances received by households, the exponential function would be applied to convert the natural logarithm of the amount of remittances to the original measurement in terms of ringgit.

The amount of remittances received by the heads of household is positively correlated with their level of education. Those with primary as well as secondary and higher education would receive RM100.82 and RM334.47 more than those who did not have any schooling. Heads of household who were engaged in agriculture sector would receive RM166.98 less than those who were not working, ceteris paribus.

Households with 3-4 members and 5 or more members would receive RM16.06 and RM106.48 less than those with 1-2 members, ceteris paribus. As expected, the

amount of remittances received increases with number of migrant children. The average amount of remittances received by households with 3-4 migrant children and 5 or more migrant children would be higher than those with 1-2 migrant children by RM304.53 and RM705.55 respectively. Controlling for other variables, the average amount of remittances received by households increases monotonically with household income. For instance, households in the RM351-700 income category would receive RM300.68 more than those in the lower income category.

Table 5.14 : Ordinary Least Square Regression of natural logarithm of the amount of remittances received by heads of household on selected independent variables

Variable	Unstandardized Coefficients	Standard Error	Standardized Coefficients	T-statistics	Significance of T-test
Constant	6.149	0.171		36.031	0.000**
Education					
Primary	0.195	0.116	0.076	1.687	0.092
Secondary and above	0.539	0.198	0.123	2.718	0.007**
Activity status					
Agriculture worker	-0.441	0.102	-0.184	-4.315	0.000**
Non agriculture worker	-0.134	0.151	-0.040	-0.890	0.374
Household size					
3 – 4 person	-0.0349	0.122	-0.014	-0.286	0.775
5 or more	-0.2580	0.134	-0.103	-1.922	0.055
Number of migrant children					
3 –4 person	0.501	0.136	0.197	3.673	0.000**
5 or more	0.919	0.132	0.387	6.966	0.000**
Total household income					
RM351 – 700	0.496	0.140	0.181	3.552	0.000**
RM701 – 1050	0.639	0.153	0.217	4.181	0.000**
RM1051 – 1400	0.716	0.172	0.199	4.165	0.000**
More than RM1400	1.297	0.160	0.437	8.092	0.000**

R-squared = 0.223
Number of cases = 550

5.6 MULTIVARIATE ANALYSES OF THE PROPORTION OF MIGRANT CHILDREN WHO HAD SENT REMITTANCES

The bivariate analyses in Chapter 4 showed that the proportion of migrant children sending remittances varies significantly across a number of socio-demographic variables. In this chapter, the net effects of each of these variables will be examined within the multivariate context. Logistic regression will be used to analyze the effects of these variables on the dichotomous dependent variable, taking the value 1 if the migrant children sent remittance, 0 if not.

The independent variables considered for analyses are: age, gender, marital status, education, current place of stay, activity status, length of absence and intention to return. All the eight explanatory variables are recoded as dummy variables. Table 5.15 shows all the explanatory variables and their respective reference categories.

Table 5.15 : Dummy variables to be used in logistic regression on the likelihood of migrant children sending remittances and the corresponding reference categories

Dummy variables	Reference category
Age	36 years old and above
Gender	Male
Marital status	Non-married
Education	Tertiary
Activity status	Non-agriculture worker
Current place of stay	City
Length of absence	More than 16 years
Intention to return	Not certain to return

Table 5.16 shows the of the observed and predicted number of households according to whether they had sent remittances to their parents in the place of origin during the last one year. The logistic regression model classified 71.97 percent of the cases correctly. The chi-square value of 328.565 with 8 degree of freedom indicates that with the use of the model, one could predict more accurately as to whether or not a migrant child sent remittances, as compared to the one based on univariate frequency distribution.

Table 5.16 : Classification table for the probability of migrant children sending remittances

	Predicted		
	Not received	Received	Percent Correct
Not received	374	428	46.63
Received	224	1300	85.30
	Overall		71.97

$\chi^2 = 328..565$ (df = 8)

The goodness of fit value is 2330.547, and the model fits the data well at 0.05 level (see Table 5.17). The model explains 13.2 percent of the variance in the proportion of migrant children who had sent remittances during the 12 months preceding the survey.

Table 5.17 : Goodness of fit test for logistic regression on the probability of sending remittances

-2 Log Likelihood	2668.099
Goodness of fit	2330.547
Nagelkerkel's R square	0.132

Table 5.18 shows the logistic regression estimates of the effects of the independent variables on the likelihood of migrant children sending remittances back home. A positive coefficient indicates an increase in the log odds and consequently an increase in the probability of sending remittances. On the other hand, a negative coefficient indicates a decrease in the log odds of sending remittances. The Wald statistics show that only four of the variables being studied (education, current place of stay, activity status and intention to return home) are significant in explaining the likelihood of migrant children sending remittances. The propensity to remit is higher among migrant children who had tertiary schooling, ceteris paribus. Migrants who were currently staying in the city were more likely to send remittances home as compared to those who had migrated to the countryside. As for the activity status, migrant children who worked in the non-agriculture sector were more likely to remit than those who worked in the agriculture sector. Migrant children who intended to return to the village were least likely to send remittances, ceteris paribus. The coefficients of other variables in the model (age, gender, marital status and length of absence) are not statistically significant.

Table 5.18 : Logistic regression analysis on the likelihood of migrant children sending remittances

Variable	Coefficient β	Standard error	Wald statitics	Significance level	Exp (β)
Constant	1.5935	0.2403	29.9336	0.0001**	
Age					
Below 36 years old	-0.2113	0.1322	2.5532	0.1101	0.8096
Gender					
Female	0.0085	0.1063	0.0064	0.9365	0.9916
Marital Status					
Married	-0.1572	0.1333	1.3925	0.2380	1.1703
Education					
Primary	-0.5841	0.1642	12.6587	0.0004**	0.5576
Secondary	-0.0485	0.1302	0.1391	0.7092	0.9526
Activity status					
Not working	-1.4741	0.1109	176.8291	0.0000**	0.2290
Agriculture worker	-0.6105	0.2067	8.7246	0.0031**	0.5431
Current place of stay					
Countryside	-0.3774	0.1032	13.3636	0.0003**	0.6856
Length of absence					
Less than 15 years	-0.1938	0.161	1.4485	0.2288	0.8239
6 - 15 years	0.0006	0.1342	0.0000	0.9966	1.0006
Intention to return					
No	0.1241	0.1884	0.4339	0.5101	1.1321
Yes	-0.7757	0.303	6.5556	0.0105*	0.4604

Model χ^2 = 328.565
Degrees of freedom = 12
Number of cases = 2326

* p < 0.05 **p < 0.01

5.7 ANALYSIS OF VARIANCE ON REMITTANCES SENT BY MIGRANT CHILDREN

The amount of remittances sent by migrant children is not normally distributed. The data is transformed into natural logarithm before further analyses. The histogram and normal curve in Figure A.9, the stem and leaf in Figure A.10 and the P-P plot in Figure A.11 in Appendix V show that the transformed data is approximately normally distributed.

The ANOVA shows that the model with 8 independent variables (age, gender, marital status, education, activity status, current place of stay, length of absence and intention to return) explains 23.6 percent of the variance in the natural logarithm of the amount of remittances (see Table 5.19). Length of absence and intention to return are excluded from further analyses as they do not have statistically significant relationships with the natural logarithm of the amount of remittances.

Table 5.19 : Analysis of variance of natural logarithm of the amount of remittances sent on characteristics of migrant children

Sources of Variation	Hierarchical Method				
	Sum of Squares	DF	Mean Square	F-test	Significance
Main effects	338.521	12	28.210	10.297	0.000
Age	32.569	1	32.569	9.416	0.000
Gender	15.506	1	15.506	12.211	0.000
Marital status	65.136	1	65.136	51.298	0.000
Education	111.979	2	55.989	44.094	0.000
Activity status	72.982	2	36.491	28.738	0.000
Current place of stay	30.400	1	30.400	22.971	0.000
Length of absence	1.553	2	0.777	0.612	0.543
Intention to return	8.396	2	4.198	2.215	0.133
Summary					
Explained	338.521	12	28.210	22.217	0.000
Residual	1930.046	1520	1.270		
Total	2268.567	1532	1.481		

R-squared = 0.236

Table 5.20 presents the results of ANOVA of natural logarithm of the amount of remittances sent by migrant children. The model explains 13.5 percent of the variance in natural logarithm of the amount of remittances. All the variables, except gender, have significant effects on natural logarithm of the amount of remittances sent. However, marital status shows a strong interaction with age and activity status ($p < 0.025$). Hence gender and marital status would be excluded from further analysis (see Table 5.21).

Table 5.20 : Analysis of variance of natural logarithm of the amount of remittances sent on characteristics of migrant children

Sources of Variation	Hierarchical Method				
	Sum of Squares	DF	Mean Square	F-test	Significance
Main effects	306.584	8	38.323	30.550	0.000
Age	32.291	1	32.291	25.742	0.000
Gender	2.641	1	2.541	2.105	0.147
Marital status	46.133	1	46.133	36.776	0.000
Education	117.166	2	58.583	46.701	0.000
Activity status	93.459	2	46.730	37.252	0.000
Current place of stay	14.894	1	14.894	11.873	0.001
Two-way interactions	80.559	26	3.098	2.470	0.000
Age * Gender	1.230	1	1.230	0.980	0.322
Age * Marital status	6.835	1	6.835	5.449	0.020
Age * Education	0.512	2	0.256	0.204	0.815
Age * Activity status	3.179	2	1.590	1.267	0.282
Age * Current place of stay	0.524	1	.524	0.418	0.518
Gender * Marital status	0.104	1	0.104	0.083	0.773
Gender * Education	1.499	2	0.750	0.598	0.550
Gender * Activity status	11.593	2	5.797	4.621	0.010
Gender * Current place of stay	0.109	1	0.109	0.087	0.769
Marital status * Education	4.355	2	2.178	1.736	0.177
Marital status * Activity status	22.024	2	11.012	8.778	0.000
Marital status * Current place of stay	0.225	1	0.225	0.179	0.672
Education * Activity status	2.439	4	0.610	0.486	0.746
Education * Current place of stay	3.080	2	1.540	1.228	0.293
Activity status * Current place of stay	2.986	2	1.493	1.190	0.304
Summary					
Explained	387.143	34	11.387	9.077	0.000
Residual	1.881.629	1500	1.254		
Total	2.268.772	1534	1.479		

R-squared = 0.135

Table 5.21 shows that all the four selected explanatory variables (age, education, activity status and current place of stay) have statistically significant effects on the natural logarithm of the amount of remittances sent by migrant children ($p < 0.01$). The model explains 10.4 percent of the variance in the dependent variable. The two-way

interactions for the four selected variables are not statistically significant and as such. MCA is deemed suitable for multivariate analysis.

Table 5.21 : Analysis of variance of natural logarithm of the amount of remittances sent on characteristics of migrant children by four selected variables

Sources of Variation	Hierarchical Method				
	Sum of Squares	DF	Mean Square	F-test	Significance
Main effects	246.909	6	41.151	31.009	0.000
Age	29.368	1	29.368	22.129	0.000
Education	113.777	2	56.888	42.867	0.000
Activity status	93.356	2	46.678	35.174	0.000
Current place of stay	10.408	1	10.408	7.843	0.005
Two-way interactions	27.510	13	2.116	1.595	0.080
Age * Education	4.598	2	2.299	1.733	0.177
Age * Activity status	3.779	2	1.889	1.424	0.241
Age * Current place of stay	3.952	1	3.952	2.978	0.085
Education * Activity status	5.953	4	1.488	1.121	0.345
Education * Current place of stay	2.401	2	1.201	0.905	0.405
Activity status * Current place of stay	5.711	2	2.855	2.152	0.117
Summary					
Explained	274.418	19	14.443	10.883	0.000
Residual	2.094.132	1578	1.327		
Total	2.368.550	1597	1.483		

R-squared = 0.104

5.8 MULTIPLE CLASSIFICATION ANALYSIS (MCA) OF THE AMOUNT OF REMITTANCES SENT BY MIGRANT CHILDREN

This section presents the results of the multiple classification analysis (MCA) of natural logarithm of the amount of remittances sent by migrant children. The explanatory variables are age, education, activity status and current place of stay. Looking at Table 5.22, all the explanatory variables used in the analysis explain 10.4 percent of the dependent variable. Based on the eta value, activity status is the most significant explanatory variables at the bivariate level, followed by education, current place of stay and age, in that order. Within the multivariate context, activity status still stands out as the most important explanatory variable.

Table 5.22 : Multiple Classification Analysis (MCA) of natural logarithm of the amount of remittances sent on characteristics of migrant children

Grand mean = 6.07

Variable	Deviation from grand mean				
	n	Unadjusted	Eta	Adjusted	Beta
Age			0.11		
Below 35 years old	936	0.11		0.05	0.06
35 years old and above	662	-0.16		-0.08	
Education			0.23		0.18
Primary	292	-0.43		-0.27	
Secondary	1004	-0.02		-0.04	
Tertiary	302	0.49		0.41	
Activity status			0.25		0.19
Not working	315	-0.36		-0.29	
Agriculture	78	-0.97		-0.74	
Non-agriculture	1205	0.16		0.12	
Current place of stay			0.14		0.07
Countryside	506	-0.25		-0.12	
City	1092	0.11		0.06	

Multiple R Squared= 0.104
Multiple R = 0.323

Table 5.23 summarizes the effects of age, education, activity status and current place of stay on amount of remittances sent. The natural logarithm of the amount of remittances was converted to the original measure in term of ringgit to facilitate interpretation. At the bivariate level, the mean amount of remittances sent tends to be negatively related to the age of the migrant children. While the same relationship generally holds true after controlling for the effects of all other variables in the model, the differentials have narrowed considerably. This may be explained by the fact that the older migrant children had more commitment towards their nucleus family and some of them might have retired. Controlling for activity status and another variables take away a large part of the difference observed across different age groups.

Table 5.23 : Multiple Classification Analysis (MCA) of natural logarithm of the amount of remittances sent on characteristics of migrant children (with conversion of natural logarithm of ringgit to ringgit)

Grand mean = RM432.68

Variable	Deviation from grand mean				
	n	Unadjusted	Eta	Adjusted	Beta
Age			0.11		
Below 35 years old	936	50.31		26.76	0.06
35 years old and above	662	-63.97		-33.27	
Education			0.23		0.18
Primary	292	-151.21		-102.38	
Secondary	1004	-8.57		-16.96	
Tertiary	302	273.59		219.29	
Activity status			0.25		0.19
Not working	315	-130.81		-108.92	
Agriculture	78	-268.66		-226.24	
Non-agriculture	1205	75.08		55.17	
Current place of stay			0.14		0.07
Countryside	506	-95.71		-48.93	
City	1092	50.31		26.76	

Multiple R Squared= 0.104
Multiple R = 0.323

The mean amount of remittances sent has a strong positive correlation with the education level of migrant children. Table 5.23 shows that after adjusting for all other variables in the model, the educational effects on the amount of remittances sent would be reduced except for those with secondary education. The educational differentials are partly explained away by other variables such as age, gender and marital status. Net of the effects of other variables, a differential of more than RM321.67 can still be observed between migrant children with primary education and those with tertiary education. The latter remitted more than twice as much as the former.

At the bivariate level, the activity status of migrant children produces sharp differential in the mean amount of remittances sent; ranging from RM164.02 for migrant children who worked in the agriculture sector to RM507.76 annually for those who worked in the non-agriculture sector. After adjusting for variations in other variables, the differential in the mean amount of remittances sent is reduced from RM343.74 to RM281.41, reflecting the significance of the indirect effects of other variables. As for migrant children who were not working (retired and housewives), the amount of remittances sent would have increased from RM301.87 to RM323.76, ceteris paribus.

As for the current place of stay of migrant children, it is found that the mean amount of remittances sent by city migrants would be RM146.02 more than migrants who lived in the countryside. Part of the differentials, however, could be due to the differentials in education and activity status. After controlling for other variables in the

model, the differentials in the mean amount of remittances still exist but with a much smaller range.

5.9 MULTIPLE REGRESSION OF REMITTANCES SENT BY MIGRANT CHILDREN

Ordinary Least Squares regression using dummy variables is performed to estimate the net effects of the predictor variables on natural logarithm of the amount of remittances sent by migrant children. The predictors that are entered into the regression model include marital status, education, activity status, current place of stay and intention to return. These predictor variables explained 13.7 per cent of the variation in the natural logarithm of the amount of remittances sent. Other variables such as age, gender and length of absence are not included as they do not have statistically significant relationship with the natural logarithm of the amount of remittances sent, or would pose problems of multicollinearity. The histogram and P-P plot of regression standardized residual (see Figure A.12 and A.13 in Appendix VI) show that the error (disturbance) term of the transformed data is approximately normally distributed. Table 5.24 shows the selected dummy variables with the corresponding reference categories.

Table 5.24 : Dummy variables to be used in regression analysis on the amount of remittances sent and the corresponding reference categories

Dummy variables	Reference category
Marital status	Non-married
Education	Primary
Current place of stay	Countrysides
Activity status	Not working
Intention to return	No

The estimated equation is as follow:

ln(remittances sent) = 5.731 - 0.436(married) + 0.281(secondary) + 0.759(tertiary) - 0.525 (agricultural) + 0.303(non agricultural) + 0.185(city) + 0.655(intend to return) + 0.296(not certain to return)

Table 5.25 shows that the education level of migrant children is the most important factor affecting the amount of remittances sent. Compared with those with primary education, the estimated amount of remittances sent by those with tertiary education would be RM350.25 higher. The estimated amount of remittances would decrease on average by RM108.94 for married migrant children as compared to unmarried children, while there would be an increase of RM62.65 on average for children who had migrated to the cities as compared to those who moved to the countryside. Migrant children who were engaged in the agriculture sector would send RM125.73, on average, less than migrant children who were not working, while those who were working in the non-agriculture sector would send RM109.10, on average, more than migrant children who were not working. Migrant children who intended to return and those who were uncertain would send RM285.20 and RM106.19 more than those who did not intend to return to their villages.

Table 5.25 : Ordinary Least Square Regression of the natural logarithm of the amount of remittances sent by migrant children on selected independent variables

Variable	Unstandardized Coefficients	Standard Error	Standardized Coefficients	t-statistics	Significance of t-test
Constant	5.731	0.102		55.914	0.000**
Marital status					
Married	-0.436	0.063	-0.156	-6.965	0.000**
Education					
Secondary	0.281	0.075	0.111	3.725	0.000**
Tertiary	0.759	0.089	0.253	8.489	0.000**
Activity status					
Agriculture worker	-0.525	0.14	-0.084	-3.740	0.000**
Non agriculture worker	0.303	0.055	0.122	5.508	0.000**
Current place of stay					
City	0.185	0.06	0.069	3.106	0.002**
Intention to return					
Yes	0.655	0.179	0.080	3.657	0.000**
Not certain	0.296	0.104	0.061	2.834	0.005**

R-squared = 0.137
Number of cases = 1904

5.10 SUMMARY

In this chapter, logistic regression shows that after controlling for number of migrant children, the probability of heads of household receiving remittances is highest for those who had the five or more migrant children and those who were not working. Pronounced differentials in the amount of remittances received can be observed across age, activity status, number of migrant children and total household income. Multivariate analyses (multiple classification analysis and multiple regression) of the amount of remittances received confirm that total household income is the most important explanatory variable, followed by number of migrant children and activity status of heads of household.

Logistic regression shows that the likelihood of sending remittances is highest among migrant children with tertiary education, those who were currently staying in the city, non agriculture workers and those who did not intend to return to the village. Multiple classification analysis and multiple regression analysis show that the activity status and education are the most important variables in explaining the variations in amount of remittances sent.