

Determinants and Modeling of Male Migrants in Bangladesh

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Abstract: The purpose of this study is to observe the background characteristics of migrants and the effects of socio-demographic characteristics of migrants as well as to fit some mathematical models to migrant population associated with age and age at marriage. For this, the data is acquired from Bogra pourusova of Bogra district, Bangladesh by purposive sampling technique. Chi-square test, logistic regression analysis, smoothing technique, polynomial model, Cross Validation Predictive Power (CVPP) and F-test are employed to fulfill the aforementioned objectives. It is identified that age, educational qualification, occupation (before migration), income (before migration), type of family (before migration) significantly effect on causes of migration. It is found that migrant population associated with age and age at marriage follow simple linear regression model and four parameters polynomial model correspondingly.

Key words: Chi-square test, Cross Validation Predictive Power (CVPP), F-test, logistic regression analysis, male migrants, polynomial model and socio-demographic characteristics

INTRODUCTION

Background of the Study: Migration is an integral part of human being. It is an unavoidable continuous process for human civilization as well as development. The pattern and source of migration is almost analogous all over the world. But, its applicability and effects are different from developed world to developing world. Nevertheless, the recent speed of globalization has given new dimension to it. Migration both internal and international has great importance for a country. Internal migration is important almost all over the place and even if, in some countries, it is far greater than international migration. Internal migration has resumed greater importance as a component of people's livelihood strategies and in shaping the national economy. Internal migration involves men, women and children, and includes rural to rural, urban to rural, urban to urban and rural to urban flows. The trends of internal migration are increasing day by day.

In Bangladesh, two-thirds of migration is from rural areas to urban areas and it is increasing very rapidly (Afsar, 2003b). The BBS 'sample vital registration system' showed that lifetime internal migration has increased significantly. The proportion of lifetime migrants doubled (from 3.4 to 7.4%) between 1974 and 1982, and reached to 10.2% in 1991. 40% of male migrants moved from rural to urban areas and 33.4% from urban to urban areas. In the period of 1974-1981, 14.2 million people in rural areas and 1.3 million people in urban areas have been migrated internally out of 15.6

million people of Bangladesh (BBS, 2003a). This trend is also unchanged in 1981-91, but slightly changed in 1991-1995 and now this rate is too high. In Bangladesh, the proportion of urban population is 15.0% in 1981 from 8.78% in 1974. It has piercing increase 19.63% in 1991. Now this rate is 23.1% (BBS, 2003b). This figure indicates that the rural area of Bangladesh is losing population and the population of urban area is increasing. Urban population in the country grew during the past three decades at an annual rate of about 6%, compared to the rural population growth of just around 2% per annum. Internal migration has contributed the most to the high rate of urban population growth. This trend is likely to continue in future as well.

The urban sector plays an important role in providing the employment to the labor force. Basic elements for employment i.e. industry, formal and informal sectors are mainly situated in and around the urban centers all over the world. Urban centers are the main sources of innovation, technological programme and cultural activities. This sector has always been acted 'Pull' factor for the in-migrants. For this reason, every year a large number of rural working populations enter into the urban areas in search of jobs and enjoy some health, education and housing facilities in the cities. Again some 'Push' factors like floods, fire, drought, earthquake or epidemic, loss of employment, political, religious reason for which people bound to migrate from one area to another.

Several studies on migration have been established with positive association between levels of infrastructure development of a region and the magnitude of out-

migrations. Regardless of skill, the migrated population can find diversified livelihood opportunities with various incomes in the cities and towns. On the other hand, a considerable number of the population migrates to urban areas from villages for higher/better education, employment and investment opportunities. These privileged migrants occasionally create employment opportunities in urban areas for the poor migrants mostly in the form of wage laborer. Though the incidence of rural-urban migration in any developing country is higher, a distinct selectivity with respect to age, sex caste, marital status, education, occupation etc., occurs and the propensity of migration differs significantly among these socio-economic groups (Yadava, 1987).

Review of Literature: Islam *et al.* (2007) observed that people migrate to certain places due to economic reasons and migration can alter the life style of individuals and families. People migrate to new places with the hope of improving their social and economic status. Faruk *et al.* (2007) studied about the socio-economic condition of migrants, they observed that all the women have to migrate after their marriage between the age range 20-34, many of them do not earn money and consequently they depend on their husbands. Rahman *et al.* (2007) identified the effects of socio-economic and demographic characteristics on causes and consequences of migration, they found that education, monthly income, type of family and land property significantly effect on causes of migration among the selected variables.

Afsar (2005) identified that there is a strong positive and negative poverty-migration nexus. Poverty induces migration as much as migration contributes to the eradication of poverty. Kuhn (2005) investigated the determinants of rural-urban migration by adult males in Matlab Thana, Bangladesh, from 1983 to 1991. He specially focused on the family migration in Bangladesh. Afsar (2003a) observed that migration played an important role in the reduction of rural poverty. The Author suggest that Small and medium towns can be made more attractive by developing infrastructure and communication, particularly efficient and safe transportation, and providing a good standard of social services such as hospitals, schools and colleges. Afsar (2003b) showed that all types of migration have recently increased significantly, The Author tried to relate internal migration with development of Bangladesh and also focus on the Government and International policy about internal migration. Siddiqui (2003) identified that migration is an important livelihood strategy for poor people while ensuring that migrant workers receive maximum protection both at home and abroad. It describes the extent, nature and types of both short and long term international migration.

Elahi (1985) observed that rural to urban migration is widely held to be the chief cause of rapid growth of urban population in the most countries. Hugo (1981) analyzed migration differential by age reveals the impact of migration on socio-economic and demographic structures at both the places of destination and origin. He found that the less of young adults through migration from villages leads to undermining of agricultural production by way of reducing agricultural laborer. Hugo (1991) observed that across the less developed countries of Asia has been consisted acceleration of urbanization from rural to urban an increase in the tempo of population redistribution from rural to urban areas, since 1970s. It is generally hypothesized that an early stage of development when the levels of urbanization are low and rates of both urban and rural natural increase are moderately high, net migration will be more important to urban population growth than natural increase. At an intermediate stage of urbanization, natural increase is predominated.

Importance of the study: Migration has an influence on population distribution as well as population redistribution within a country. So, migration changes the distribution of population both at the place of origin and the place of destination, which affects the economic, social, demographic condition of a country positively or negatively. Migration enhances the process of urbanization as well as industrialization. Actually, it is no doubt linked to the process of overall economic development and social condition of a country.

The census data of Bangladesh is not sufficient to study the causes, patterns and consequences of migration and socio-demographic characteristics of migrants because only some information about place of birth is available. Therefore, it is important to bestow attention to micro-level studies based on sample surveys, which will help to study the background characteristics of migrants as well as different types of migration in the country. It is to note that the characteristics of migrants are sufficient to explain the selectivity of migration because the decision of a person to migrate is largely dependent on his family background. The socio-economic characteristics of migrants can give some idea about which type of people is involved in the process of migration. Thus, it is necessary to study the socio-economic characteristics of migrant households to get an idea about the influences and consequences of migration. Therefore, it is important to understand intentions of migration, degree of migration and its effect on the growth of urban population for proper urban planning as well as for furthering rural development.

Objectives of the study: Therefore, the fundamental objectives of this study are stated below:

- To study the background characteristics of migrants and also to examine the significance of some selected socio-economic and demographic variables on causes of migration for male migrants.
- To identify the determinants of socio-economic and demographic characteristics for the causes of migration due to service by applying logistic regression analysis,
- To fit mathematical model to the migrant population related to age and age at marriage, and to apply Cross Validation Predictive Power (CVPP) for verifying how much the model is valid.

MATERIALS AND METHODS

Data source of this study: A total number of 185 male migrants were questioned during May 20, 2007 to June 20, 2007 in this research. The respondents were interviewed by some selected questions from Bogra pourusova of Bogra district, Bangladesh by purposive sampling technique. Various socio-economic and demographic variables were considered at the time of data collection.

Bivariate and logistic analysis: Bivariate analysis is used to test the association between the categorical variables by applying Chi-square test in the present study. In bivariate analysis, it is found that a complex set of relationship exists between demographic and socio-economic related characteristics; which affect the migrants in the study area. But bivariate analysis does not allow for quantification or testing the strength of migration determinants among the selected variables. That is why; it is essential to employ multivariate technique to identify the effects of variables on migration. In this study, logistic regression analysis is used to identify the significant variables and determinants of migration.

The logistic regression analysis is one of the most important methods for the successful application not only in demography but also in all disciplines of knowledge. This method is very useful for identifying various risk factors in case of qualitative variables. Cox (1972) has developed linear logistic regression model. Furthermore, Lee (1980) developed logistic regression model. This logistic model can be successfully used not only to identify risk or prognostic factors but also to predict the probability of success. This model expresses a qualitative dependent variable as a function of several independent variables, both qualitative and quantitative (Fox, 1984). In logistic analysis male migration due to service is treated as dependent variable. Let *Y* be male migration due to service that is a dichotomous dependent variable, which takes values 1 and 0, that is, *Y* is classified in the following way:

$$Y = \begin{cases} 1, & \text{if causes of migration is service} \\ 0, & \text{otherwise} \end{cases}$$

It is noted that age, income pattern before migration, educational qualification, occupation before migration, type of family before migration and type of migration are considered as an explanatory variable that is used for analysis in the model.

Smoothing of age data related to migrants population:

It is observed that there is some kind of unexpected distortions in the data aggregate when the data of male migrants associated with age group in years and age at marriage is to be found on graph papers. Therefore, an adjustment is important and needed to alleviate these unexpected distortions before going to fit the models to these data series. As a result, a modification is given here using the Package Minitab Release 12.1 by the smoothing method “4253H, twice” (Velleman, 1980). Afterward, the smoothed data are used to fit and these are launched in Table 4.

Model Fitting: Using the scattered plot of migrants by ages, it is observed that migrants population is linearly distributed with respect to ages. Therefore, a simple linear regression model is considered and the form of the model is:

$$y = a_0 + a_1x + u \tag{1}$$

where, *x* represents mean value of the age group; *y* stand for male migrants; *a*₀ and *a*₁ are unknown parameters and *u* is the disturbance term of the model.

From the dotted plot of migrants by age at marriage, it has been seen that migrants in terms of age at marriage can be fitted by polynomial model. In this case, an *n*th degree polynomial model is treated and the structure of the *n*th degree polynomial model is:

$$y = a_0 + \sum_{i=1}^n a_i x^i + u \tag{2}$$

where, *x* is the average value of age at marriage; *y* is migrants; *a*₀ is the constant; *a*_{*i*} is the coefficient of *x*^{*i*} (*i* = 1, 2, 3, ..., *n*) and *u* is the error term of the model. Here a suitable *n* is chosen for which the error sum of square is lowest amount.

Using the software STATISTICA, these mathematical models have been estimated.

Model validation:

For model validation, the Cross Validation Predictive Power (CVPP) denoted by *σ*_{cv}² and it is computed using the following formula

$$\sigma_{cv}^2 = 1 - \frac{(n-1)(n-2)(n+1)}{n(n-k-1)(n-k-2)} (1 - R^2)$$

Where n is the number of classes, k is the number of regressors in the model, and R^2 is the coefficient of determination of the model. The shrinkage coefficient of the model is equal to the absolute value of $\lambda = (\sigma_{e_i}^2 - R^2)$, (Stevens, 1996). If the value of λ tends to zero, then the prediction is better. Furthermore, the stability of R^2 of the model is equal to 1- shrinkage coefficient. It is noted that CVPP is also applied as model validation technique (Islam, 2005).

F-test: To find out the measure of overall significance of the fitted models as well as the significance of R^2 , the F-test is employed to these fitted models.

RESULTS AND DISCUSSION

The frequency and percentage distribution of background characteristics of migrants are presented in Table 1.

Age of the migrant: Age is an important demographic factor for the analysis of the nature of migration. The Table 1 represents that 23.3% migrant's current age is 55+ years which is highest and 5.4% migrants lie in the age group 30-34 which is lowest among the other age group.

Age at marriage of the migrant: Age at marriage of the migrants is an important factor that influences the migration. From the Table 1, it is observed that most of the migrants (17.9%) are married in the age group 26-27 and lowest (5.9%) belongs to the age group 19-20.

Age at the time of migration: Again age is one of the most important influential factors in case of taking decision to migrate to another place. Very older people do not always like to migrate in spite of their many sufferings in the place of origin. On the other hand, young people usually try to get a hand to migrate a place where have some bright future. So age at the time of migration is an important factor for migration related studies. The Table 1 represents that the age at the time of migration is high in the age group 25-29 and it is 20%. The lowest percentage is obtained in the age group less than 20 years, which is only 9.7%.

Educational qualification of migrant: Education is the key that unlocks the key to modernization, more clearly it can be said that education is the backbone of a nation. No nation can grow without education. So education plays an important and imperative role in human life. As a consequence, education is a very important factor in the analysis of migration. A number of studies showed that migrants are usually more educated with respect to the place of origin and with respect to the place of

destination. On the other hand, education is an important pull factor for which an individual takes decision to migrate one place to another. The Table 1 shows that most of them are higher educated and their percentage is 56.2% and among them 6.5, 8.6, 13.5 and 15.1% are illiterate, primary, secondary and higher secondary level educated respectively.

Causes of migration: People migrate from one place to another place for many causes. The causes of migration can be classified mainly as economic causes, demographic causes, social causes, political causes, education and cultural causes, geographical causes. In this study, the causes of migration are classified into seven categories, which have shown in the following Table 1. It is found that male migrants are migrated to the present place for taking job which percentage is 50.3 and 24.3% are migrated for business and the lowest number of male migrant migrate due to marriage which percentage is 2.7%.

Process of internal migration (type of migration): The internal migration of a country may have the form of rural to rural, rural to urban, urban to urban, urban to rural. As my study area is an urban area and I only include in-migration in my study, so I have obtained two categories of migration named rural to urban and urban to urban. In the Table 1, it is showed that, 73.5% migrants are migrated from rural area and only 26.5% are migrated from urban area.

Occupation (after and before migration) of migrant: Occupation is a very important factor in the analysis of migration especially for the male migrants. In every year, a large number of rural population migrated to urban area for better occupational status. Availability of job opportunity at the place destination plays a very important role in regard to the process of migration decision. On the other hand, pre-migration occupation also helps to understand the causes i.e. push factors behind migration. Pre-migration occupation also helps to understand the causes of migration. The Table 1 shows clearly that most of the migrants 51.9% are service holder, 22.7% are engaged in business and only 3.8% are farmer before migration. But after migration from the same table, it is seen that most of the migrants (57.3%) are service holder and 26.5% are engaged in business. Thus we see that occupational status of migrants after migration is increased for service and business purposes.

Association: The results of association between causes of migration due to service among some selected socioeconomic and demographic characteristics of migrants are demonstrated in Table 2. From Table 2, it is seen that educational qualification, occupation before

Table 1: Frequency and percentage distribution of background characteristics of male migrants

Background characteristics	No. of migrants	(%)	Background characteristics	No. of migrants	(%)
i) Age group (in years):			ii) Age at marriage (in years)		
25-29	16	8.6	19-20	11	5.9
30-34	10	5.4	20-21	18	9.7
35-39	29	15.7	22-23	28	15.4
40-44	28	15.1	24-25	26	14.0
45-49	27	14.6	26-27	33	17.9
50-54	32	17.3	28-29	25	13.6
55-60	43	23.3	30-31	28	15.1
Total	185	100.0	32-33	16	8.7
iii) Age at the time of migration (in years)			Total	185	100.0
<20	18	9.7	iv) Educational qualification		
20-24	26	14.1	Illiterate	12	6.5
25-29	37	20.0	Primary	16	8.6
30-34	28	15.1	Secondary	25	13.5
35-39	27	14.6	Higher Secondary	28	15.1
40-44	21	11.4	Higher educated	104	56.2
45+	28	15.1	Total	185	100.0
Total	185	100.0	vi) Type of migration		
v) Causes of migration			Urban to urban	49	26.5
Economic	9	4.9	Rural to urban	136	73.5
Marriage	5	2.7	Total	185	100.0
Service	93	50.3	viii) Occupational status (after migration)		
Business	45	24.3	Farmer	3	1.6
Labor	12	6.5	Service	106	57.3
Environment	12	6.5	Business	49	26.5
Others	9	4.9	Labor	17	9.2
Total	185	100.0	Others	10	5.4
vii) Occupational status (before migration)			Total	185	100.0
Farmer	7	3.8			
Service	96	51.9			
Business	42	22.7			
Labor	11	5.9			
Others	28	15.1			
Total	185	100.0			

migration, type of family before migration and type of migration are highly associated with causes of migration. But, it is found that there is no significant association between age of migrants, income pattern before migration between causes of migration, that is, the causes of migration due to service.

Results of logistic analysis: The results of logistic regression model are demonstrated in Table 3. It is observed that the effects of age, educational qualification, occupation before migration, type of family before migration and type of migration on the causes of migration due to service are statistically significant. It is also noted that explanatory variable income pattern before migration is statistical insignificant on dependant variable.

The regression coefficients for the age group 30-34 years and for the age group 35 years and above are -0.133 and -2.172, respectively. The odds ratio for that age group is 0.875 and 0.114, respectively. This implies that the respondents of age group 30-34 years are 0.875 times lower and the age group 35 and above are 0.114 times lower risk for migration due to service than the reference category (<30 years).

The regression coefficients for the educational level at secondary and higher secondary level are 3.304 and 4.216, respectively, which implies that increasing

educational qualification has positive impact on male migration due to service and the odds ratio 27.220 and 67.791 means that the risk of male migration due to service is 27.220 and 67.791 times higher than that of the reference category (primary).

The regression coefficients for the business and labor and others before migration are -3.397, -1.491, respectively and their corresponding odds ratio are 0.033 and 0.225, which implies that the male migrant whose occupation was business is 0.033 times lower, and whose occupation was labor and others is 0.225 lower risk of migration than the reference category who was service holder.

The regression coefficient for the male migrants whose type of family before migration was joint is -0.775 and the odds ratio is 0.461, which implies that the male migrant whose type of family was joint have 0.461 times high risk of migration than the reference category, male migrant whose type of family was unit before migration.

The regression coefficient for the male migrant who are migrated from rural to urban is -1.069 and the odds ratio is 2.911, which indicates that the male migrant who are migrated from rural to urban area, 2.911 times lower than the reference category, who are migrated from urban to urban area.

Table 2: Association between causes of migration and some selected socio-economic variable of male migrants

Background Characteristics	Calculated value of χ^2 d.f.p	Tabulated value of χ^2	Significance at 5% level
Age of male migrants	$\chi^2_{cal} = 2.220$ df = 2 $\rho = 0.330$	$\chi^2_{tab} = 5.991$	Insignificant
Educational qualification	$\chi^2_{cal} = 37.197$ df = 2 $\rho = 0.000$	$\chi^2_{tab} = 5.991$	Significant
Occupation before migration	$\chi^2_{cal} = 57.428$ df = 2 $\rho = 0.000$	$\chi^2_{tab} = 5.991$	Significant
Income pattern	$\chi^2_{cal} = 5.661$ df = 2 $\rho = 0.059$	$\chi^2_{tab} = 3.841$	Insignificant
Type of family before migration	$\chi^2_{cal} = 5.493$ df = 1 $\rho = 0.019$	$\chi^2_{tab} = 3.841$	Significant
Type of migration	$\chi^2_{cal} = 7.783$ df = 1 $\rho = 0.005$	$\chi^2_{tab} = 3.841$	Significant

Table 3: Logistic regression estimates for the effects on causes of migration by some selected demographic and socio-economic variables

Demographic and socio-economic characteristics	Co-efficient(β)	Significant(p)	Odds ratio
Age of household head:			
<30 (R.C)	-	0.047**	1.000
30-34	- 0.133	0.926	0.875
35 and above	- 2.172	0.076	0.114
Educational qualification:			
Primary (R.C)	-	0.003*	1.000
Secondary	3.304	0.020**	27.220
Higher Secondary and above	4.216	0.001**	67.791
Occupation before migration:			
Service (R.C)	-	0.000*	1.000
Business	- 03.397	0.000*	0.033
Labor and others	- 1.491	0.035**	0.225
Income pattern before migration:			
No income (R.C)	-	0.631	1.000
<5000	- 0.067	0.935	0.935
5000 and 5000+	- 0.565	0.477	0.568
Type of family before migration:			
Unit (R.C)	-	-	1.000
Joint	- 0.775	0.088***	0.461
Type of migration:			
Urban to urban (R.C)	-	-	1.000
Rural to urban	- 1.069	0.037**	2.911
Constant	- 0.197	0.917	0.821

$R^2 = 0.449$, $r_{ev}^2 = 0.410214$, Shrinkage = $\lambda = 0.038785771$, *: Significant at $\rho < 0.01$, **: Significant at $\rho < 0.05$, ***: Significant at $\rho < 0.10$
R.C means reference category

Table 4: Observed, smoothed and predicted values for the model of migrants associated with age group and migrants related to age at marriage

Model of migrants associated with age group				Model of migrants related to age at marriage			
Age group (in years)	Observed	Smoothed	Predicted	Age at marriage (in years)	Observed	Smoothed	Predicted
25-29	16	15	14	19-20	11	11	19
30-34	10	18	18	20-21	18	18	24
35-39	29	23	22	22-23	28	25	28
40-44	28	26	27	24-25	26	28	29
45-49	27	29	31	26-27	33	29	28
50-54	32	34	35	28-29	25	28	25
55-60	43	42	39	30-31	28	25	19
				32-33	16	19	19

Table 5: The results of CVPP and information on model fittings for migrants associated with age group and migrants related to age at marriage

Models	n	K	R ²	r _{cv} ²	Shrinkage	Parameters	p-value
1	7	1	0.97367	0.95486	0.018807	a ₀	0.028
						a ₁	0.00004
2	8	3	0.99652	0.986298	0.0102225	a ₀	0.018
						a ₁	0.05591
						a ₂	0.34667
						a ₃	0.72698

To testify the adequacy of this logistic model, CVPP is applied in this study and its value is 0.410214 representing that the model is more than 41% stable. Furthermore, the shrinkage of this fitted model is $\lambda = 0.038785771$. The shrinkage coefficient is indicated that the model is better fit. The stability of R² for this logistic model is more than 96%.

Results of model fittings: The simple linear regression model is undertaken to fit the models to migrant population related to age as well as associated with age at marriage. The fitted models are described below:

$$y = -8.98571 + 0.85x \quad (1)$$

for migrants in terms of age
t-stats (-3.32923) (13.59667)

$$y = -163.191 + 13.49554x - 0.21036x^2 - 0.000947x^3 \quad (2)$$

for migrants due to age at marriage
t-stats (-3.842) (2.66829) (-1.06557) (-0.374582)

The predicted values are established in Table 4 and information of model fittings are presented in Table 5.

It is seen from the Table 5 that the fitted models are highly cross validated and their shrinkages are only 0.018807 and 0.0102225 for the models (1) and (2) respectively. And the fitted models are more than 95 and 98% stable respectively for the models (1)-(2). Moreover, the proportions of variations of the fitted models are explained more than 97%. Furthermore, the stability of R² of these models (i) to (ii) is also more than 98%.

In this study the calculated value of F-statistic are 184.91 and 286.36 for the models (i) to (ii) respectively while the tabulated value of F is 16.3 with (1, 5) degrees of freedom (d.f.) for model (1) and 29.5 with (3, 3) d. f. for model (2) both of them at 1% level of significance. That is, the fitted models are highly significant. Thus, these models provide better fit to the male migrants with age and age at marriage.

CONCLUSION

Most of the migrant's (23.3%) current age is 55+ years where 5.4% migrants lie in the age group 30-34 which is lowest among the other age group. It is observed that most of the migrants (17.9%) are married in the age

group 26-27 and lowest (5.9%) belongs to the age group 19-20. It is found that age at the time of migration is high in the age group 25-29 and it is 20% while lowest percentage (9.7%) belongs to the age group less than 20 years. Most of them are higher educated and their percentage is 56.2%. It is found that male migrants are migrated to the present place for taking job which percentage is 50.3 and 24.3% are migrated for business purposes. It is showed that, 73.5% male migrant are migrated from rural area and only 26.5% male migrants are migrated from urban area. The Table 1 shows clearly that most of the migrants 51.9% are service holder, 22.7% are engaged with business, only 3.8% are farmer before migration. But after migration from the same table, it is seen that most of the migrants (57.3%) are service holder and 26.5% are engaged in business. Thus we see that occupational status of migrants after migration is increased for service and business purposes.

In logistic analysis, it is found that age, educational qualification, occupation (before migration), income (before migration), type of family (before migration) significantly effect on causes of migration. It is seen that migrant population associated with age follow simple linear regression model where as migrant population related to age at marriage is distributed by four parameters polynomial model.

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