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**Factors Affecting Migration: A Model of Decision
Making of Medical Faculty Members in Egypt .**

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Labour migration has been one of the most debated features of the Egyptian economy. In Egypt many empirical studies have been carried out concerning migration and its trends, but the main deficiency of the current literature on the determinant of migration is the large gap between theoretical analysis and empirical application. To bridge the gap between theoretical analysis and empirical applications, the present study has been carried out. In order to explain the determinants of decision making of the family to migrate, a sample has been drawn from the population of Medical Faculty. Then, We built an operational model based on theoretical framework. Three methods of estimation have been used namely, ordinary least squares, logistic and two stage least squares.

The most significant factors in the three estimators are age, salary in Egypt, salary abroad, acquiring new skills, economic factors, number of books and researches, psychological factors of the head of the household and the wife's work, status.

1. Introduction

Labor migration has been one of the most important and the most debated feature of the Egyptian Economy. Normally migration flows are the consequences a large number of decision by individual household. Many theoretical models have been developed to explain the migration decisions of families. Empirical investigation of migration has also been attempted to understand and analyze the process of external migration (Dierx, 1988).

In Egypt, many empirical studies have been carried out, concerning migration and its trends (Soliman et. al 1988, Fergany, 1987, NADA 1991), but the main deficiency of the current literature on the determinants of migration is the large gap between theoretical analysis and empirical application in Egypt, if no direct link is established between a theoretical model and its empirical specification, the empirical results can not validate the theoretical model.

To bridge the gap between theoretical analysis and empirical application, the present study has been carried out. Our basic



hypothesis is that individual move in response to economic and other incentives such as being involved in academic research and papers. Considering single individual, the variable to be explained, migration, is binary, either you move or you stay.

In order to explain the determinants of decision-making of an individual to migrate, a sample has been drawn from population of medical faculty. The significance of the problem lies in the fact that we are dealing with one of the scarce resources that the country has (emigration of university). The social cost involved and the losses to the economy as a whole as a result of this migration may be extensive because this is due to the relatively large amounts of educational expenditure involved and the long gestation period needed to create a single member of the university academic staff.

Emigration of the academic staff of universities is two kinds, permanent and temporary. This research refers to the temporary one. In order to determine the factors affecting migration decision of medical doctors, we built an operational model based on theoretical framework. Three methods of estimation have been used namely ordinary least squares (OLS), logistic (maximum likelihood) and two stage least squares (2SLS).

This paper is divided as follows:

1. Introduction which includes statement of the problem and the objectives of this study.
2. Review of the related studies.
3. Operational model and data description.
4. Analysis of empirical results.
5. Conclusion

II- Review of Related Studies

This section deals with one of the theories of migration and also discusses some of empirical studies on labor migration in Egypt.

II.1. The migration theory

The purpose of this part is to set a theoretical foundation from previous studies to derive our empirical migration model. Many theoretical models have been developed to explain the migration of families.

Theories of migration deal most directly with voluntary migration. Voluntary migration means that individuals makes decisions about whether or not to move. There are three groups of theories that try to explain the causes of migration. These groups of theories are :

- (1) Ravenstein's Laws of Migration. This theory related streams of to migration differences among categories of people. We will not deal with this theory because we deal with one category only.
- (2) The second one is Ecological theory. It assumes that an equilibrium exists between population size, social organization, technology and the environment. This theory was used to explain migration from rural to Urban areas which is not our concern.
- (3) The third one is Decision - Making theory. The decision-making theory postulated four hypotheses. For every decision to migrate there will be (a) positive and negative factors associated with the place of origin, (b) positive and negative factors associated with the place of destination, (c) intervening obstacles, and (d) personal factors (Daugherty and Kammeyer, 1994, PP. 107 - 135).

Initially, one member of the family, the head of the household generates income. A family's potential real income is determined by the stock of human capital and by the rent per unit of human capital. The head stock of human capital is composed of location - Specific human capital and non-Specific human capital. Location specific human capital is defined as the concrete assets and other feature specific to a place that contribute to the head's production capacity such as experience with the production process in the dominant industry (Professional) at a certain location, knowledge of the employment possibilities and wage structure.

$$\text{i.e. } S_k = \frac{\text{number of yours obrood}}{\text{rest of the yoars untile retirement}}$$

Non -Specific human capital is knowledge and skills that can be used at all locations.

$$\text{i.e. } S_c = \frac{\text{number of yours abroed}}{\text{number of yours of education}}$$



The rent per unit of human capital at the family's place of residence is assumed to be fixed. The only way in which a family can increase its return on its stock of human capital is by moving to location with a higher rent on human capital (Deirx, 1988).

II.2. Labor Migration in Egypt:

Egypt has faced economic and political problems that stimulated external migration including high rates of unemployment, overpopulation and low wages.

The recent history of migration since the seventies can be divided into two major phases (Soliman et al, 1988).

I. The oil Boom. This period began with the sharp increase in the oil prices of 1974 and was accelerated by the open Door policy of Sadat. The Egyptian government made several basic changes in laws and regulations facilitating the emigration of Egyptian nationals. These measures were concurrent with the increased demand for labor in the oil exporting countries.

II. The Early 1980's: The oil boom collapsed early 1980's into oil bust, straining the economies of the Gulf states and their capacities to support new projects and new workers. Furthermore, within this declining market, there was a tendency to replace Egyptian labor by East Asian Labour. The impact of returnees on Egyptian labor market and the economy at large has been analyzed by many authors (Soliman et al, 1988, El Khawaga, 1989, El Howeidy, 1991).

Estimates of Egyptians working abroad vary a lot. Amin and Awny referred to confusion and wide discrepancies as common aspect of these various estimates (Awny and Amin, 1986). According to CAPMAS estimates, the number of Egyptians working abroad amounted to 1,573 million in 1987, 90% of whom work in Arab countries (El Sayed, 1992).

Some of the salient aspects of the migration process- basic characteristic of migrant, impact of migration on income distribution, socio- economic effect of migration, the effect of remittances - have been studied by different authors. (Amin and Awny 1988, El Sayed, 1992).

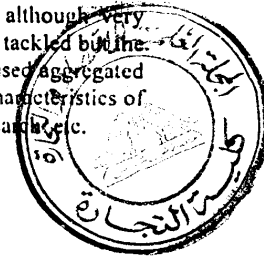
El Sayed was mainly interested in the impact of remittances on the socio-economic groups in Egypt. The study was divided into three parts: characteristics of migrant, socio-economic groups to which the migrant belonged, and remittances and their impact on the different socio-economic strata. The study concludes that remittances have helped in raising the standard of living of returnees although this may be of a temporary nature.

Another study was concerned with whether the contribution of workers' remittances deserves the sacrifice of losing skilled labour or not (Mattar, 1995). The aim of study was to investigate and analyze the short run impact of labor migration on the macro as well as micro levels of the Egyptian economy. A two version short run model CEG was employed to clarify the effect of changes in remittances and labor supply on the real side of the economy.

The study demonstrated that the short run effects of changes in remittances labor migration depend on specific circumstances. The increase in workers' remittances do in fact contribute to the Egyptian gross domestic product. However, this contribution is limited by the condition that domestic labor supply does not change. If there is a cut in the labor supply that accompanies the increase in remittance, the situation is more complicated. On the positive side, household well being tends to improve and there is room for more domestic investment or a reduction in Egypt's foreign's liabilities. On the negative side, exports are discouraged and real GDP is likely to fall.

Regarding policy implications, the above analysis shows that it is advisable for the government to encourage labor migration when the labor market is slack. This may help in reducing unemployment rates. However, restriction must be imposed on the migration of some categories of labor such as professional and highly skilled laborers.

A review of the above studies indicates that although very important aspect of the migration process has been tackled but the majority of the above studies were empirical and used aggregated data which does not indicate the specific personal characteristics of the migrant such as level of intelligence, personal research, etc.



Moreover, they did not relate decision making to migration. Decision making models takes into account the factors that affect decision making whether to migrate or not. This help us to put our hands on the factors, which affect migrant decision. Our study tries to treat this deficiency inn the current literature.

III. Operational Model and Data Description

The purpose of this section is to present how data were collected and the formation of the model (building) and the estimation procedure to estimate significance of the variables using OLS, 2SLS and logistic model which uses maximum likelihood estimation.

Data Sampling Procedure

Research concerning labor migration in Egypt face the inadequacy of detailed data pertaining to this important phenomena. Even the number of migrants for the same period is different from different resources (Amin, 1986 and El Sayed, 1992). A questionnaire was designed and was tested as a pilot questionnaire, and one of the questions was not clear specifically the one which is related to "how many years of education have you taken" and was corrected by how many years of education have you had since primary school and including Ph. D. (Doctor of Philosophy). The sample was drawn from the medical academic university faculty of different universities. The sample consists of hundred questionnaires and the response consisted of 50% respondents. The chosen sample is homogeneous.

The Operational Models and Estimation Procedures

Two kinds of operational Models will be used which are (1) Binary-choice Models allow us to deal with two possible models specification (linear probability Model and logistic Mode. (2) Simultaneous equation model. There is a trade-off in selecting the appropriate models from the several possible models.

1.A. Linear Probability Model

The regression from of the model is:

$$Y_i = a + Bx_i + E_i \quad (1)$$

$Y_i = \begin{cases} 1 & \text{if the person migrates} \\ 0 & \text{if the person did not migrate} \end{cases}$
 X_i = the explanatory variables like income, experience education, number of children, age and so on .

The ordinary least squares (OLS) procedure is going to be used to estimate the coefficients. But the shortage of OLS is that observations for which Y_i (L_i) is close to zero (0) or close one (1) will have relatively low variance, while observation with L_i closer to 1/2 (half) will have higher variances. i.e. The problem of heteroscedasticity exist, but this problem does not by itself result in either biased or inconsistent estimates.

1.B. Logistic Model

The logistic model is based on the cumulative logistic probability function and is specifies as

$$p_i = Y_i = F(A+BX_i) = f(Z_i) = \frac{1}{1 + e^{-Z_i}} \dots\dots\dots(2)$$

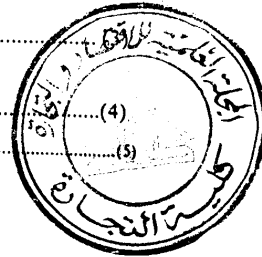
Maximum likelihood estimators is going to be used to estimate the parameters of the model. The advantage of that estimator is that to overcome the problems of efficiency and the predicted value of Y_i is between one and zero .

2- Simultaneous Equation Model

The processes understudy can be best represented by a series of simultaneous interdependent equations because decision to migrate and the income generated from the outside are simultaneously determined (interrelated). The model is presented as follows:

$AA = F(CC, hh, \hat{II}, jj, NN) \dots\dots\dots(4)$
 predicted income from outside
 where: $II = F(AA, DD, FF, GG, LL, BB) \dots\dots\dots(5)$

$AA - a_{01} - a_{12} II - a_{13} hh - a_{14} CC - a_{15} JJ - a_{16} NN = U_{1t}$



$$\hat{H} \cdot a_{20} \cdot a_{21} \cdot AA \cdot a_{22} \cdot BB \cdot a_{23} \cdot DD \cdot a_{24} \cdot FF \cdot a_{25} \cdot GG \cdot a_{26} \cdot LL = U_{12} \dots \dots \dots (6)$$

Order condition:

$$K - k \geq m - 1 \quad K = 9 \quad k = 4 \quad m = 2$$

$K - k > m - 1$ equation (5) is over identified.

$$H_E = S_k H \dots \dots \dots (7)$$

$$H_E = B_0 + B_1 \text{ education} + B_2 \text{ experience} \dots \dots \dots$$

Rank Condition

Rank condition requires that Jacobian determinant is not zero
i.e. $P(J) \neq 0 \dots \dots \dots (8)$

Variables equation	I	AA	H _E	BB	CC	DD	FF	GG	hh	JJ	LL	NN
1	a ₀₁	1	-a ₁₂	0	-a ₁₄	0	0	0	0	-a ₁₅	0	a ₁₆
2	a ₂₀	-a ₂₁	1	-a ₂₂	0	-a ₂₃	-a ₂₄	-a ₂₅	0	0	-a ₂₆	0

$$P(J) = - (a_{22} + a_{23} + a_{24} + a_{25} + a_{26}) \neq 0 \dots \dots \dots (9)$$

So the rank condition is satisfied.

where :

AA= Decision - making which is equal one if the family migrate and zero if the family do not migrate .

NN Father's physiological element

JJ Acquiring new skills

KK number of published researches

EE Monthly salary in Egypt

E_{E_c} = s_c . monthly Salary

hh = wife migration

DD= professional (Professor , Associate Professor and Assistant Professor)

GG = acquired skill outside

LL = Number of the Rooms

BB = age

ii_E = S_k . monthly Salary abroad

ff experience (working Years as a faculty members)

CC is a proxy to I.Q test (smartness)

Apply tow stages least squares require that order condition and rank condition are satisfied i.e , the order $k - k \geq m - 1$

The rank condition $P(J) \neq 0$

where : K is the number of the explanatory variables the model

k is the number of the explanatory in the specific equation and P is rank .

J is Jacobian determinant

m is the number of dependent variables in a specific equation.

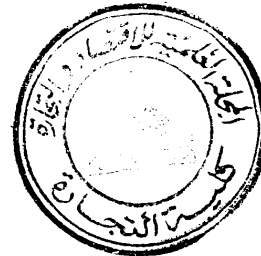
IV. Analysis of the Empirical Results

The purpose of this section is to identify statistically these factors (variables) affecting migration of the migrants. Three sets of regressions have been run, the first and the second ones, the dependent variable is the decision variable which takes the value one if the head migrated and zero if the head did not migrate. This dependent variable was used in both OLS and a maximum likelihood procedures. The third Model, two dependent variables were used which were the Dummy variable (decision to migrate) and the predicted income from the new region (i.e. as a result of migration). The predicted income from outside was estimated by regressing it on experience and years of education to get the reservation wage to use it for the entire sample (Madkour, 1992), the result was as follows:

$$\hat{ii}_E = 0,00301 + 0.789 \text{ Education} + 0.534 \text{ experience}$$

(0.501) (4.29) (7.201)

$R^2 = 60\%$ f statistics 48.391



The numbers between the brackets show the t statistics. The purpose of this equation is to get the reservation wage to use it for the entire sample.

OLS, Maximum likelihood and 2 SLS results.

Dep. Var.	Ind. Var.	OLS	Logistic	2SLS	Sign expect	OLS	Logis	2 SLS
AA (used in ols)	BB	0.005807*	-1.325**		-	-		
Logistic	CC	0.001848*		0.005869*	+	+		+
	DD		-0.4135*		?		+	
	EE	0.000309*	0.006011**		-		+	
AA, ii (used in 2SLS)	FF							
	GG	0.0423*			+	+		
	hh	0.0975*	0.253*	0.1032	+	+	+	+
	ii _E	0.105**	14.186**	0.11143**	+	+	+	+
	JJ	0.117**	0.73401**	0.200612**	+	+	+	+
	kk	-0.0391*	0.254		?	+	-	
	LL	0.093071**	-0.3813*		?	-	-	
	mm		0.375*		+	+	+	
	nn		1.5013*	0.2939**	+		+	+
	oo		-0.701*		?		-	
	pp		-0.261**		-		-	
	QQ		0.12033*		?		+	
	RR		0.0193*		?		+	

* Significant at 10%

** Significant at 1%

Logistic model	2SLS Model	OLS model
loglikelihood 228.281	$R^2 = 0.739$	$R^2 = 0.9088$
Dependent Variable	F. statistic 20.1964	F static. 44.853
is the decision making	instrument variables	
	BB, DD, FF, LL,	

The results obtained in the table demonstrated that most of the explanatory variables had the expected signs in the three procedures, and the most significant factors related to decision-making are as follows:

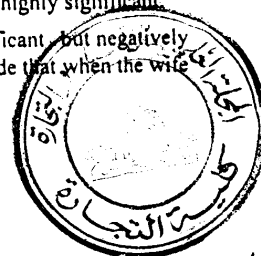
In the logistic model, salary outside (\hat{ii}_E), acquiring new skills (jj), salary in Egypt (EE), number of rooms (LL), age (BB), number of books and researches written outside (KK) and wife work which is negatively to migration (PP).

But in the two stages least squares results the most significant factors are smartness (cc), salary abroad (ii), acquiring new skills (JJ) and psychological factor of the migrant (NN).

In the OLS procedures the most significant factors are income from outside (ij) acquiring new skills (jj) and Economic factor (LL), age (BB), smartness, salary in Egypt, using his experience (GG), and number of books and researches (kk).

The variables which have the expected sign are (hh, ii, jj) which stated that as more acquired new experience (jj), the more likely to stay outside. Also the more income which is generated from outside (ij) the more likely to stay longer period. And the economic factor is the reason to stay (LL), the more likely to stay more outside. However, age (BB) expected to be negatively related to the decision of migration, but in the case of OLS result, the sign is positive, i.e. The older the age, the more likely to migrate, but this could be explained as the head of household gets older the more his responsibility towards himself and his family so he wants to use the rest of his stock of human capital to generate more income. But in the case of logistic analysis, the sign is negative which support the theory that, younger people are willing to migrate more than older. Also, the variable (kk) which related to number of researches and books have been done during migration period. This variable have negative sign which explains that as the number of researches and books increase the decision to come back home land decreases (the negative sign in both OLS and logistic results). The variable (ll) number of rooms in the apartment is negatively related decision to migrate, in the logistic result. But in the result of OLS it is positively related to the decision to migrate. The variable related to child education (MM) seems not highly significant and have a positive sign which mean the decision to migrate is positively related to children's education outside the home land. The (oo) psychological factor is negatively related to the decision to migrate in logistic estimation which mean that children do not like to have their school because of friends and relatives. This variable is highly significant.

The variable wife work is highly significant but negatively related to the decision to migrate, so we conclude that when the wife has work she is less likely to migrate.



The above discussion indicates that logistic results are the most appropriate as they validate the theory of migration i.e. The results demonstrate that migration decision is related to family decision not to the head of the household.

Conclusion

Migration flows are the consequences of interrelated individual decision reflecting the characteristics of each one. This study tries to explain the factors affecting decision making based on a theoretical framework. Qualitative models (linear probability model and cumulative logistic probability model) and simultaneous equation model have been used to investigate those factors. Nonspecific human capital and specific human capital have been used to adjust the income generated from abroad and local income.

The empirical study demonstrated that most of the explanatory variables had the expected signs in the three procedures. The most significant factors related to decision making are as follows: salary abroad, acquiring new skills, salary in Egypt, economic reasons, age, the number of books and papers written abroad, work of the wife, psychological factors and level of intelligence. However, age, number of researches and books, and economic reason have positive sign.

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العوامل المؤثرة في الهجرة

نموذج لاتخاذ قرار الهجرة لأعضاء هيئة التدريس من كليات الطب في مصر

إن موضوع الهجرة إلى خارج القطر من الموضوعات الهامة وخاصة من ناحية استنزاف العقل البشري (المهارات والكوادر العالية) . وقد انقسمت الدراسات السابقة في موضوع الهجرة إلى نوعين الأول دراسات وصفية والثاني دراسات استخدمت بعض النماذج القياسية وكلا النوعين لم يربط بين النظرية والناحية التطبيقية مما جعلنا متحفظين في الأخذ بنتائج هذه الدراسات كمؤشر لوضعي السياسة الاقتصادية (Policy Makers) .

إما هذه الدراسة فقد تميزت بربط النظرية والناحية التطبيقية القائمة على البيانات التفصيلية الخاصة بقرار المهاجر أو غير المهاجر في الاختيار بين الهجرة وعدم الهجرة . وقد صممت استمارة استقصاء خاصة لهذا الغرض وكان عدد من هذه الاستمارات مائة وكانت نسبة الاستجابة ٥٠٪ . وهذه البيانات تعتبر من انطباق البيانات لدراسة قرارات الأفراد . وقد استخدم النموذج الاختياري الازدواجي (Binary - choice Models) للوقوف على العوامل التي تؤثر في قرار الهجرة . وبالإضافة إلى هذا فقد استخدم نموذج المعادلات الأتية للتوصل إلى معرفة النتائج التطبيقية .

وقد أوضحت نتائج هذه الدراسة أن أهم العوامل المؤثرة في قرار الهجرة للخارج مقارنة المرتب بمصر بالخارج ، العمر ، اكتساب مهارات جديدة ، المؤلفات والأبحاث بالخارج ، العامل النفسي للمهاجر وعمل الزوجة .

