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SOCIO - ECONOMIC DETERMINANTS OF ACHIEVED FERTILITY IN EGYPT

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INTRODUCTION AND LITERATURE REVIEW :

There are many approaches used by demographers , other social scientists and policy-makers to examine the socio-economic differentials in human fertility. The proximate determinants (intermediate variables) framework of K. Davis and J. Blake (1956) is one of the most widely used frameworks that has been developed by sociologists. According to this framework, a fertility has been considered as a function of eleven intermediate variables, through the steps of reproduction. The David and Blake factors all represent behavioral characteristics which can be observed and measured for individuals, groups, or social collectivities , whereas the dimension of preferred family size must be inferred indirectly .

The basic assumption underlying the Bongaarts's model (1978) is that, if all women were married throught a reproductive span, used no contraception, had no induced abortion and no lactational infecundability, the number of children they would have is the total fecundity rate or the potential fertility, which was suggested by Bongaarts to be about (13.5 to 17.5 births). Bongaarts set eight variables from the Davis and Blake framework and his a model selected only these four variables which exert a major effect on fertility .

Also, within the sociological approach, the main concerns of Freedman (1962) and Peterson (1969) was the decision regarding deliberate fertility control which is thought to be dependent upon three considerations : motivation, attitudes, and access. a couple's motivation for deliberate fertility control is determined by thier concerns about having to many children or having them to soon. Favourable attitudes toward delibearate fertility control are expected to prevail as psychiological costs of fertilty control decline. These favourable attitudes depend on the acceptability of the idea of deliberate fertility control and the couple's feeling about the appropriateness of deliberate fertility control techiques. Access pertains to the availability of deliberate fertility control sevices and supplies Freedman suggested a somewhat more complex Framework as shown in Figure (1) . He argued that Davis and Blake " intermediate varible " between socially established " norms" regarding fertility and the actual fertility outcome. He noted that, the socially-determined " norms " may not coincide exactly with the individuals' desired or preferred fertility. However, the social norms are assumed to be the dominate factors. Norms considers as a " prescription" for guiding behaviour in a given categoryof similar situation. They are the key of element in sociological theories of fertility. This sociological model of fertility. It begins with the intermediate variables and then moves to wider range of social demographic and environmental influences. Freedman's framework

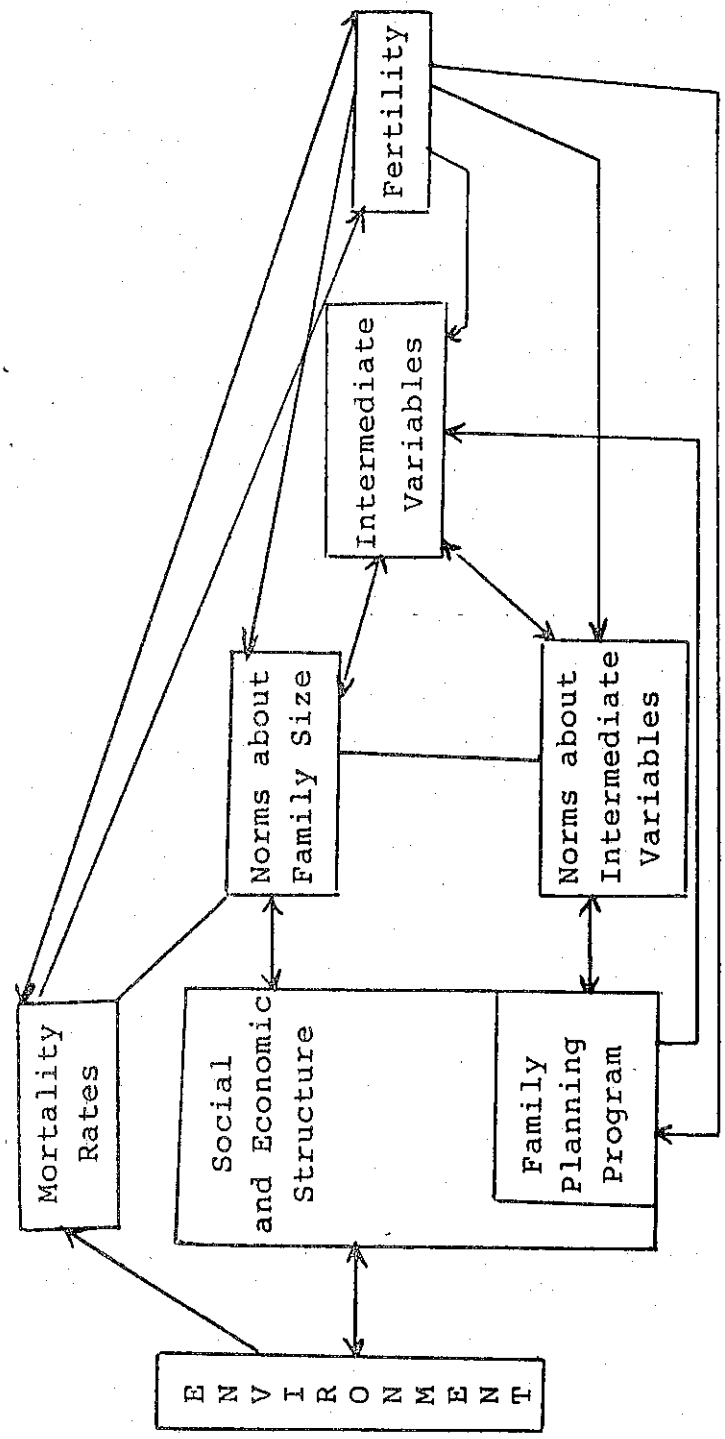

Figure (1): A Sociological Model of Fertility, Soruce: From Freedman, The Sociology of Human Fertility, (1962, P.15).

includes family planning programs as an impotant element within social and economic structure .

The second spproach to discuss fertility is the " utility-cost theory " or the economic theory of fertility explanation of fertility has received much attention and has elaborated considerably in recent years. Such as Becker (1960, 1965, 1971, 1974) Easterline (1968, 1975, 1986). Schultz (1976, 1980, 1981), and H. Liebenstein (1957, 1969,1975) . Its basic ideas were set fourth by H . Liebenstein in 1957 :

" It is not going too far to say that the essential element to be explained is the incentive or rational behind the desire to have larger or smaller families. We have to visualize various contraceptive techniques as merely facilitating factors the utilization of which involves an economic or emotional cost of some sort. But the major burden of any theory must be on the explanation of the forces that create the necessary motivations for the creation of smaller rather than larger families .

A distinction has to be made between the knowledge of alternatives and the choice among known alternatives. It seems reasonable to suppose that as incomes increase, the knowledge of the alternatives pertinent to family limitation also increases. But we still have to explain what determines the choice from among a range of known alternatives. The basic idea behind our theory is that motivations with respect to family size are, to a considerable extent , rational; that, on the whole, parents will want an extra child if the satisfactions to be derived from that child are greater than the "costs" that are involved-where "costs" are to be interpreted rather broadly [Liebenstein 1957 , p.159] . "

Thus, the "utility-cost" explanation of fertility assumes, first, that people behave rationally with respect to their own fertility, that they behave as if they were applying rough calculations to the problem of determining the desirable number of births. Second, these calculations are assumed to be directed toward balancing the satisfacation or utility to be derived from an additional child against the "cost" both monetary and psychological, of having that child .

The theory distinguishes between three types of "utility" to be derived from an additional child :

1 - The child's utility as a "consumption good" , i.e. , as a source of personal pleasure to the parents .

2- The child's utility as a "productive agent", i.e, as a person who may be expected eventually to work and contribute the family income .

3 - The child's utility as a potential source of security , e . g ,in the parents old age.

The costs of having an additional child are both direct and indirect :

1 - The direct costs are the usual expenses of maintaining the child until he is self supporting .

2 - Inderect costs are incurred when opportunities- for example , the wife's employment- are forgone because of the child's existence .

In any case, all the economic approaches see fertility as resulting from a rational decision based on an effort to maximize a more -or- less complicated economic pay-off function subject to direct and also indirect (opportunity) costs within income-resource constraints and in the light of other possible pay off from alternative uses of resources . Figure (2) presents a rough model of the processes and relationships being treated .

Furthermore, a complete understanding of fertility behavior will be impossible unless and until the psychological variables involed are identified (Namboodiri, 1979, p.466) .
Namboodiri suggests that psychological factors such as education or matrial status and the fertility outcome. The psychological factors such as the psychological characteristics of individuals which affect the fertility outcome .

The simplest and most straight forward psychological theory of fertility is that advanced by Fishbein (Fishbein,1972). He arguse that fertility, in common with most other human activities, is determined by intentions which are, in turn, determinined by personal attitudes towards achieving these intentions: by the relevant normative beliefs on such behavior obtained from peers; and by the personal attitudes towards the important or unimportant depending upon personal attitudes and intentions. Fishbein argues that all other factors, including economic ones, affect fertility behavior through these attitudes and intentions .

There is an attempt by B.C. Rosen and A.B. Simmons (1971) to discover and assess some linkages between macroanalytic variables, social-psychological variables, psychological variables, and fertility. Examining relationshipes between industrialization and social class, hasband-wife decision-making processes, wive's attitudes, and fertility. Rosen and Simmons suggest that education and new employment opportunities prompte respectively, "modern" conceptions of the role of women in society and egalitarian decisionmaking in the family . These, in turn, are related to perferences for smaller families and to lower fertility .

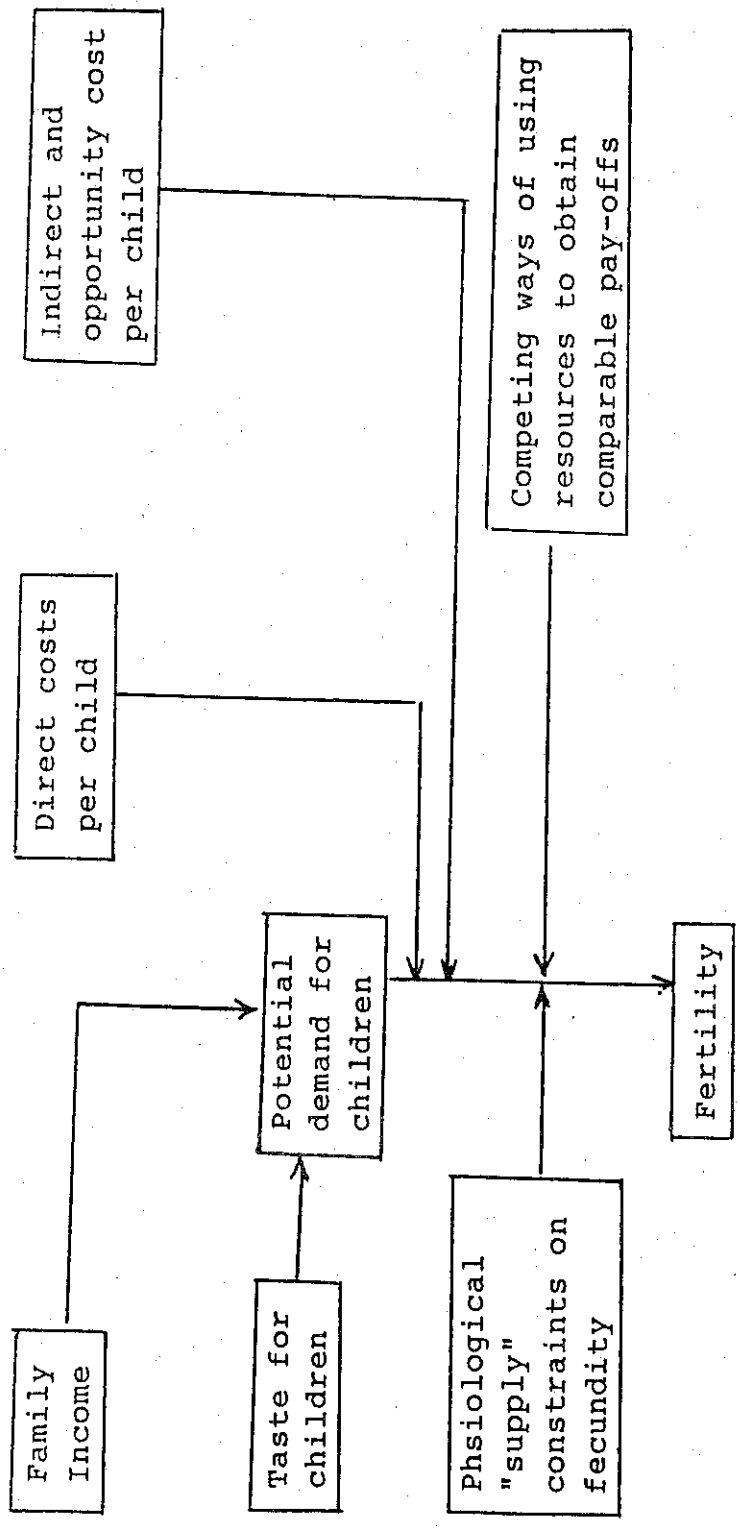

Figure (2): A Composite Model of Fertility.

Soruce: Warren C. Robinson and Sarah F. Harbison "Toward a Unified Theory of Fertility", in Demographic Behavior: Interdisciplinary Perspectives on Decision-Making, Edited by Thomas K. Burch P.206. 1972 .

Figure (3) shows the directions of relationships between the structural-psychological factors and fertility in industrial communities studies by Rosen and Simmons.Fertility-denoted " actual family size " in the diagram - was found to be directly influenced :

1 - Negatively by extent of "wife's at participation in decisions" (i.e wife's participation in family decisions is associated with low fertility ; nonparticipation or low levels of participation with high fertility) ;
2- Negatively by " wife's role attitudes " (i. e. , the possession of strong attitude concerning independence of wife's role is associated with low fertility) ;
3- Positively with " wife's perferred family size " ;
4- Positively with wife's age : the older the wife , the more children ;
5- Negatively by wifes'education: the higher the educational achievement, the lower the fertility
6- Negatively by husband's occupational status; and
7- Negatively by wife's labor force status : wives who work tend to have fewer children .

In addition to the above, the fertility was found to be indirectly influenced :
1 - By wife's role attitudes, since they affect wife's participation in decision positively and wife' 'preferred family size negatively ;
2 - By wife's education, since it affects wife's role attitudes positively ;
3 - By husband's occupational status , since it affects wife's role attitude positively ;
4 - By wife's labor force status, since it affects wife's role attitudes positively .

Finally, a framework toward a unified theory of fertility was introduced by W. C.Robinson and S. F. Harbison (1980). Figure (4) lists factors relevant to fertility decisions on the individual, family, and social levels and suggests a model. This model says that the sources of demand for children are economic but that non-economic forces (femal drives towards motherhood , or a male desire for dominance) are also sourses of utility . these "expectational" elements provide the most important way in which variations in individual psychological and personality factors affect demand. Thus, tow individuals confronted with the same objective situation and the same real potential pay-off may still respond differently if their subjective appraisals of future events are different .

In any given situation,or for any given birth parity , it is quite possible that one set of

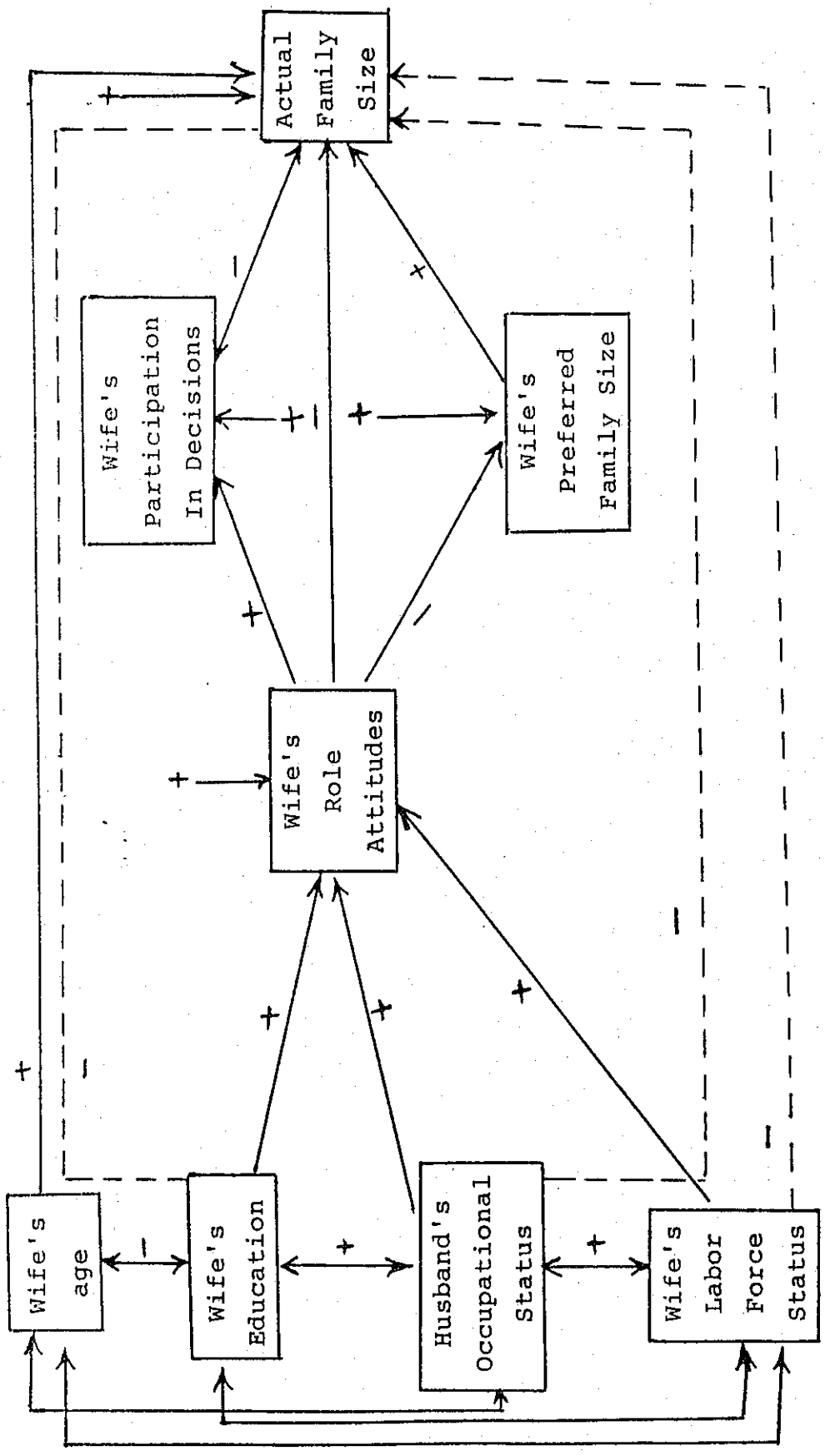

Figure (3): Causal Diagram of Structural-Psychological Factors Related to Fertility in Indsutrial Communities. Source: Rosen and Simmons 1971, P.64.

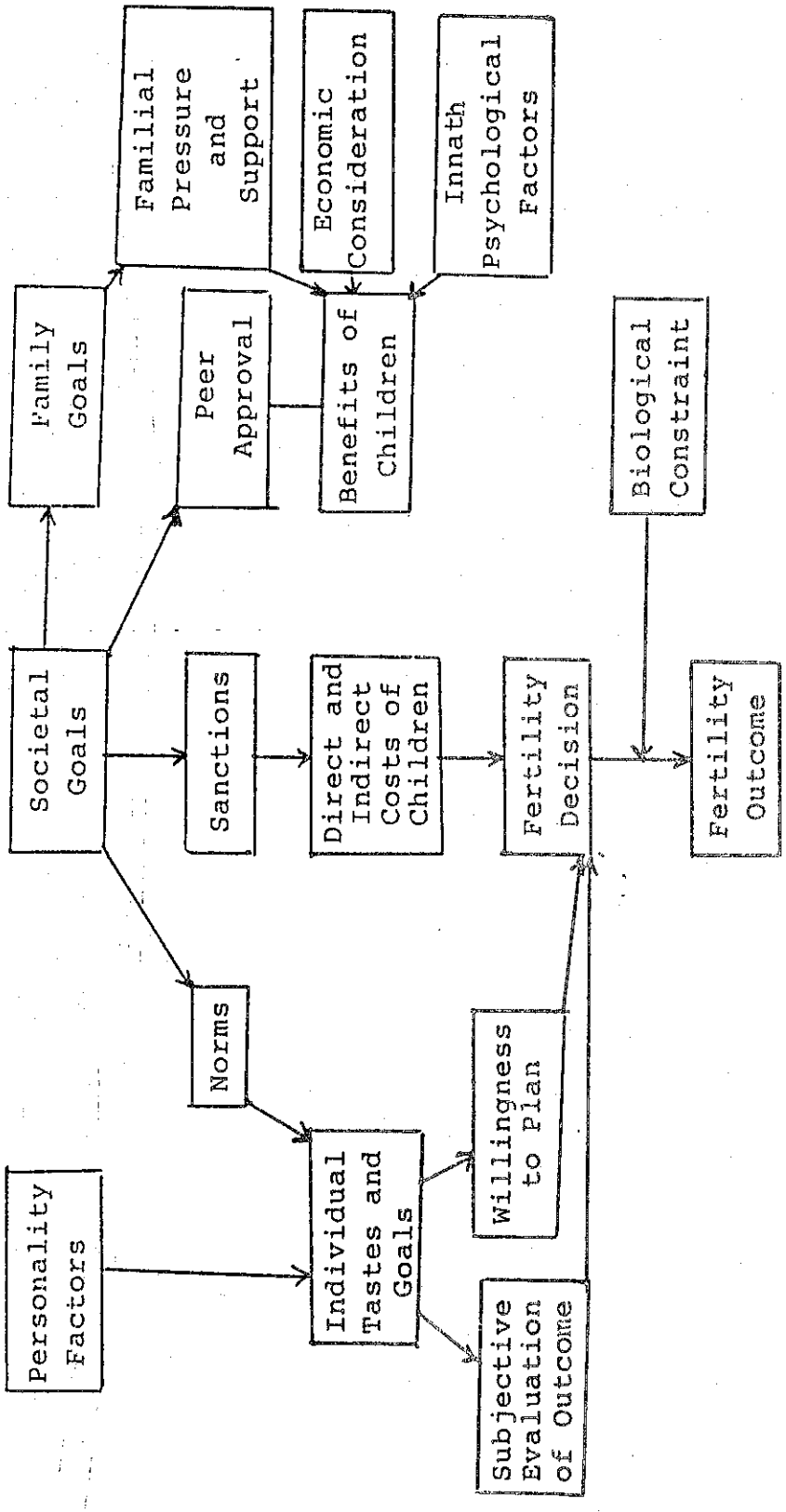

Figure (4): An Integrated Model of Fertility

Soruce: W.C. Robinson and S.F. Harbison, 1980, P.206.

force may dominate and overshadow the other. Thus, the parity one birth decision may be strongly affected by the fundamental psychological "values" while economic factors become more important for higher parities. Social "norms" may dominate individual utilities in socieites. The theoretical frame of reference suggests no fixed relationship among economic, social and psychological factors in the fertility decision, only that all are present and that a unified theory must take all into account .

OBJECTIVE OF THE RESEARCH :

The main objective of this research is not only to examine the impact of these important socio economic variables on achived fertility, but also, to reveal the important inside each variable .

DATA SOURCE:

The Egyption Fertility Survey (EFS) was carried out during the period February-June 1980 by the central Agency for public Mobilisation and statistics. The EFS was conducted as part of the World Fertility Survey (WFS), with the collaborration of the World Bank. The primary purpose of the the EFS was to provide planners and policy makers with a comprehensived set of data EFS was designed as a tow-phase survey. In the first phase survey ,three auestionnaires were used : the household schedula,the individual questionnaire for ever-married women was the main component of the survey. It was administered to Egyption, evermarried women,under 50 years of age,who were usually resident in the sample households . The second phase survery utilized tow questionnaires : the household economic questionnaire, and theindividual questionnaire for husbands.

The analysis of this paper depeded totally on the ever - maried women for 8788 women, where the number of questionnairs successfully completed in the individul survey for ever maried women was 8788 or 97.9 per cent of the possible maximum .

The principal report on the egyption fertility survey was published in1983 and consists of four volumes : the first volume describes the desgin and methodolgy of the survey, the second and third volumes present the main findings of the first and secnd phase surveys respectively, and the fourth volum contains the detailed statistical tabulations based on the data collected in the first phase survey .

Two special studies for eyaluating the EFS survey were conduted. the first study, by El-Deeb, repoted that the EFS pfovides an useful and accuate source of data which were not

previously available in Egypt (EL-Deeb,1986).The secnd study was conducted by Colae. he argued that women overstate their ages, since both marriages and births appear to occur at younger age than they actully do occur. This bais causes of false time-trend of rising age at marriage and results in a period Total fertility Rate that is too low (colae, 1983) the conclusion for both studies is that there is no evidence of omission of birth. So, the data should be of high quality for birth interval analysis .

THE METHODOLOGY :

Multiple Classification Analysis (MCA) is used to study the effects of each independent variable on the achived fertility (the children ever-born (CEB)). M. C. A. is a statistical method which has the advantage of dealing with predictor variables as week as nominal measurements. The procedure of MCA is the special case of additive analysis of variance. It finds a best fitting additive structure in which the sum of squares of the average residuals weighted by the sample size in each cell is minimized :

$$SS = \sum_{J=1}^{J} \sum_{K=1}^{K} n_{jk} \ (\bar{Y}_{jk} - \hat{\mu}_{jk})^2 \qquad (1)$$

where ,

n_{jk} is the number of cases in each cell ;

$\bar{Y}_{jk}$ is the sample mean in cell jk;

$\hat{\mu}_{jk}$ is the fitted mean in cell jk which takes the additive form calculated by MCA

and $\hat{\mu}_{jk} = \hat{\mu} + \hat{\alpha}_j + \hat{\beta}_k$ (for all j , k) , $\hat{\mu}$ is the weighted average of the adjusted means for either factors .

$\hat{\alpha}_j$ and $\hat{\beta}_k$ are the adjusted effects of the factors .

The constants $\hat{\mu}$, $\hat{\alpha}_j$ and are chosen so that the fitted values are as close as possible to the sample means . More precisely , they are chosen so that the weighted sum of squares (1) is to test the frameworks which inter dneed by some sciemnt ecominet in the previous section is minimized i.e. MAC calculates fitted values ($\hat{\mu}_{jk}$) that minimize (SS) .

An important property of MCA is that it weights the squared residuals by the sample size in each cell (n_{jk}) . Empty cells are therfore ignored because they are given the weight zero . Also when the sample size of a particular cell is small, it is given less weight which implies that the observed means are allowed to deviate more form the observed means i.e. subject effects

when the cell sample size is small .

DEFINITION OF THE VARIABLES :

1. DEPENDENT VARIABLES :

(A) The demographic control variables :

(1)Marriage Duration:The number of years of the marrige for the women accounted up to the data of the survey. The control for marriage duration is needed because of its stronge association with the number of children ever born and its relationship with socio-economic factors.

(2)The ageat marriage : This variable refers to the maried womens age at the first marriag . the age at marriag has some independent effects on fertility and has effects that overlap those of socio-economic variables. The age mariage and the duration of marriage provide an implecit control for age and hence, for boilogical factors associated with age.

(B) The socio - economic variables :

(1) Wifes level of education;

(2) Husband's level of education ;

(3) Type of current residence (Urban / Rural);

(4) Husband's socio - occupational status;

(5) Wife's work history ;

(6) Wife's work status since marriage+

(7) Religion.

A brief definition of the socio - economic variabls follows :

(1) Wife's level of education : This measure represents the level of educational status are illiterate (no school - some school) ' can read and write ; primay ; secondary ; and university

(2) Husband's level of education : This measure represents the level of education completed by the respondent husband . The educational status are (no school - some school) ; can read and write ; primary ; secondary ; and university .the construction of this variable was in most respecets identicl to that of wife's level of education.

(3) Type of current residence : Sample areas were classified as 'Urban' or ' Rural ' in accordance with the official standard designation used by all government agencies.

Essentilly, there were three criteri for distinguishing urban from rural place of residence at the time of the survey . The three criteirie are population size , legal or administrative status and socio - economic characteristics.

(4) husband's socio - occupational status:

seven broad categoies are used , these categories relate to the WFS system as follows :

Category	WFS Category
Professional, technical, administrative and manageril	1
Clrial	2
Sales	3
Farmer (self-employed)	4
Agriculturel workers (employees)	5
Service	6.7
Manual	8.9

This classification was used as an indicator of status .

(5) wife's work history : Work status before marriage are as follows: Family; employee; Self-emmployed ; and Did not work

(6) wife's work status since marriage: this variable consists of : family; Employee; Self; employed ; and Did not work

(7) Religion : the religion of husband and his wife is moslem or Christian or Other

STATISTICAL RESULTS AND CONCLUSIONS:

Table (1) presents mean number of children ever born with eath independent indicator. It is clear that mean number of children ever born increases with age and years since first union, but it decreases with age at first union. this result is expected since women with more exposure to fertility are supposed to have larger parities. As for type of place of residence, fertility differentials are not that clear although rular woman still have larger parities as expected. fertility differentials by religion are unexpected since the well know belief is that chirstian women have less parties than Moslem woman. Yet, the differce is not significant (2.09 for moslems,2.17 for Christians) The mean number of childern ever born is decreasing as level of education increases. This result is supported by the findings of a study on the relationship of education and number of living children for women not wanting more children. this study used a subset of the data set considered here (see Mahgoub, 1990) Moreover, the mean number of children ever born is decreasing as partner's level of education increases, but the trend is not as clear as that of level of education for women. work status before union

TABLE 1

Mean Number of Children Ever_Born and Each Indepedent Indicator

	Mean Number of Children Ever-Born			
1- Age	15-24	25-34	35+	
	1.22	**1.94**	**3.73**	
	(2276)*	(3219)	(3293)	
2- Age at First Union	<20	20-29	30+	
	2.19	**1.60**	**1.22**	
	(6791)	(1920)	(77)	
3- Years since First Union	<10	10-19	20+	
	1.29	**2.26**	**2.91**	
	(3580)	(2698)	(2510)	
4- Type of Place of Residence	Urban	Rural		
	2.04	**2.13**		
	(3289)	(4998)		
5- Religion	Moslem	Christian		
	2.09	**2.17**		
	(7823)	(464)		
6- Level of Education	Illitrate, No School, Some School	Can Read and write	Primary	Secon-dary
	2.14	**2.04**	**1.84**	**1.30**
	(6790)	(857)	(413)	(227)
7- Partner's Level of Education	Illitrate	Can read and write	Primary	Secon-dary
	2.16	**2.20**	**2.01**	**1.66**
	(4338)	(2199)	(715)	(1035)
8- Occupation Before First Union	Did not Work	Professional, Clerical, Sales	Agriculture	Othe
	2.10	**1.33**	**2.10**	**1.8**
	(7279)	(402)	(810)	(297

TABLE 1 (Continued)

9- Work STatus Before First Union	Family	Other Paid	Else	
	2.08	1.66	2.09	
	(599)	(797)	(7392)	
10- Partner's Occupation	Did not Work	Professional, Clerical, Sales	Agriculture	Others
	0.0	1.83	2.17	2.05
	(0.0)	(1904)	(3325)	(3559)
Grand Mean	2.05			
	(8788)			

* Base Frequencies of Women are Given in Parentheses.

seems to negatively affect parity only for "other paid" category. mean children ever born increased if partner's occupation is related to agriculture

CROSS TABULATION :

The chi-square test statistics show that every independed (except religion) has a higly significant effect on number of children ever born (see the Appendix)

M . C . A . RESULTS :

due to the inability of the personal computer (PC) to handle too many independent indicators when applying multiple classification analysis (MCA), the independent indicators are divided into three main groups to avoid the fluctnation. Group 1 includes age, years since first union, and age at first union. Group 2 encompasses some social indicators,namely; level of education , partner's level of education , religion and type of place of residence. Groupe C consists of three independendent indicators related with occupation. This indicatoers are occupation before first union, partner's oocupation, and status before first union. An additional you (Group 4) is concidered where the independent indecators concerning only women are used to explain number of children ever born while controlling for age .

The coefficients for a given predictor estmated by solved the normal eqution are called adjusted or net effect of that predictor. this effect measure those of that predictor alone after taking into consideration effects of all other predictors in the model. if there is no intercorrelation among the independent predictors in the model, the unadjusted effects would be identical with the adjusted or net effects. the eta (η)coefficient is a correlation ratios, which shose how well a given predictor can explain the variation in the dependent variable, while the eta^2 (η^2) coefficient indicates the propration of the variation explained by the predictor alone These coefficients are applicable to the unadjusted means. The coefficient beta (β) is similar to eta (η) but applicable to the adjusted means. Thus, the beta (β) coefficient in multiple regression analysis . Similarly , the beta^2 (β^2) coefficient is the proportion of the variation explained by the predictor, after taking into account the proportion explained by other predictors in the model .

Table (2) shows that years since first union has the largest effect on number of children ever born (η^2 =0.467 , β^2 =0.2025) . Age has the second largest effect on number of children ever born (η^2 =0.372 , β^2= 0.068) . But age at first union explains little of the vaeriation in number of children ever born (η^2 = 0.068 , β^2 = 0.036) although it significantly affects number of children

TABLE 2

MCA Results for Group 1

Analysis of Variance (ANOVA)

Source of variation	Sum of squares	D.F.	Mean square	F.	Significance of F.
Main Effects:	4315.180	6	719.197	1518.324	0.000
Age	159.110	2	79.555	167.952	0.000
Age at First Union	201.313	2	100.657	212.500	0.000
Years Since First Union	363.170	2	181.585	383.351	0.000
Explained	4315.180	6	719.197	1518.324	0.000
Residual	4159.366	8781	0.474		
Total	8474.546	8787	0.964		

Multiple R = 0.714 R^2 = 0.509

TABLE 2 (Continued)

Multiple Classiciation Analysis (MCA)

Variable & Category:	Number of cases	MCA Coefficients	
		Unadjusted	Adjusted for independents
Age:	(η^2=0.3721, β^2=0.068)		
15-24	2276	-0.83	-0.40
25-34	3219	-0.11	0.04
35+	3293	0.68	0.24
Age at First Union	(η^2=0.068, β^2=0.0361)		
<20	6791	0.14	0.10
20-29	1920	-0.45	-0.31
30+	77	-0.83	-0.76
Years since First Union	(η^2=0.4671, β^2=0.2025)		
<10	3580	-0.76	-0.49
10-19	2698	0.21	0.12
20+	2510	0.86	0.57

ever born according to the analysis of variance (ANOVA) results . It is worth noting that the three independent indicators in group 1 seem to highly affect number of children ever born (p-value = 0.000). Moreover, the ratio of the explained variance is 0.509 which is the highest ratio among the four groups .

The main advantage of (MCA)is to reveal that the contribution of each age group. for example , in age group 12-19 , redncton in mean children ever born by 40%, in contrast, other age groups. So, if we deal with one variable as a whole, it may be given either negative or positive effect. Thus. It can hidden these effects. and so on, for the other variable as shown in table (2) .

Table (3) shows the results concerning group 2 . These results show that type of place of residence is the only predictor in this model which is insignificant (p-value=0.651). The proportion of variation in number of children ever born explained by the independent indicators considered in this model is too small (R^2= 0.035) .

Table (5) shows MCA resluts for group 4 where age is considered as a covariatevariate. It has been noticed that years since first union still has the largest effect on number of children ever born even after controlling for age
(η^2 =0.4761 , β^2 = 0.1681) . The analysis of variance results show that occupation before first union does not significantly affect on numer of children ever born after controlling for age

CONCLUSION :

The results have shown that age and age related indicators (years since first union and age at first union) are the best group of independent indicators to explain number of children especilliy ever born especially age at 20-29, because it is imposible to delay marriage after this age in a society like Egypt. so,increase age at first marriage can play an important part espeacially in developing countries which family planning programe is still weak. in comparing the effect of age at first marriage in some developed as, Italy,and Spain we found that, the impact is greater or achieved fertility, this is due to the hige standard level of socio economic exert agood role for this variable moreover,years since first union has the largest effect on number of children ever born even after controlling for age ! level of education seems to highly affect number of children ever born. Therefore, if the target is to decrease number of children ever born age at first union has to be raised. it is helpful in this regard to raise the educational level for women since it significantly affects number of children ever born.

The main conclusion can be considerd that,the policymakers should list thier priorities in

dealing with socio economic variables. Also, emphising which catorgy is more important than other inside each variable .

TABLE 3

MCA Results for Group 2

Analysis of Variance (ANOVA)

Source of variation	Sum of squares	D.F.	Mean square	F	Significance of F.
Main Effects:	295.735	8	36.967	39.376	0.000
Type of place of Residence	0.192	1	0.192	0.204	0.651
Religion	9.851	1	9.851	10.494	0.001
Level of Education	50.929	3	16.976	18.083	0.000
Partner's level of Edcuation	98.068	3	32.689	34.820	0.000
Explained	295.735	8	36.967	39.376	0.000
Residual	7771.533	8278	0.939		
Total	8067.268	8286	0.974		

Multiple R = 0.191 R^2 = 0.037

TABLE 3 (Continued)

Multiple Classification Analysis (MCA)

Variable & Category:	Number of cases	MCA Coefficients	
		Unadjusted	Adjusted for independents
Type of place of Residence:	(η^2=0.0016, β^2=0.0001)		
Urban	3289	-0.05	0.01
Rural	4998	0.04	0.00
Religion:	(η^2=0.0004, β^2=0.0016)		
Moslem	7823	0.00	-0.01
Christian	464	0.08	0.14
Level of Education:	(η^2=0.0225, β^2=0.0081)		
Illitrate	6790	0.05	0.03
Can Read and Write	857	-0.06	-0.01
Primary	413	-0.26	-0.15
Secondary +	227	-0.79	-0.50
Partner's Level of Education:	(η^2=0.0289, β^2=0.0169)		
Illitrate	4338	0.06	0.04
Can Read and Write	2199	0.10	0.09
Primary	715	-0.09	-0.09
Secondary +	1035	-0.43	-0.31

TABLE 4

MCA Results for Group 3

Analysis of Variance (ANOVA)

Source of variation	Sum of squares	D.F.	Mean square	F	Significance of F.
Main effects:	298.742	7	42.677	45.831	0.000
Work status Before First Union:	0.235	2	0.118	0.126	0.881
Occupation Before First Union	63.628	3	21.209	22.777	0.000
Partner's Occupation:	57.667	2	28.833	30.964	0.000
Explained	298.742	7	42.677	45.831	0.000
Residual	8175.803	8780	0.931		
Total	8474.546	8787	0.964		

Multiple R = 0.188 R^2 = 0.035

TABLE 4 (Continued)

Multiple Classification Analysis (MCA)

Variable & Category	Number of cases	MCA Coefficients	
		Unadjusted	Adjusted for Independents
Work Status Before First Union: (η^2=0.0169, β^2=0.0001)			
1. Family paid cash, Family paid kind, and Family unpaid	599	0.02	0.03
2. Other paid cash, Other paid kind, and Other unpaid	797	0.39	0.00
3. Self Employed, Did not Work, and Not stated	7392	0.04	0.00
Occupation Before First Union: (η^2=0.0289, β^2=0.0196)			
1. Did not work	7279	0.04	0.05
2. Professional, Clerical, and Sales	402	-0.72	-0.60
3. Agricultural, Self-Employed, Agric., Employed by other	810	0.04	-0.03

TABLE 4 (Continued)

4. Household Services, Other Services, Skilled Labour, Unskilled Labour, and Not Stated	297	-0.24	-0.21
Partner's Occupation: (η^2=0.0169, β^2=0.0081)			
1. Did not Work	0.00	0.00	0.00
2. Profesional, Clerical, and Sales	1904	-0.22	-0.14
3. Agricultural, Self-Employed, Agricultural, Employed by Other	3325	0.12	0.09
4. Household Services, Other Services, Skilled Labour, Unskilled Labour, and Not Stated	3559	0.00	-0.01

TABLE 5

MCA Results for Group 4

Analysis of Variance (ANOVA)

Source of variation	Sum of squares	D.F.	Mean square	F.	Significance of F.
Covariate Variable					
(Age)	3047,173	1	3047.173	6329.097	0.00
Main Effects	1036.058	10	103.606	215.193	0.00
Age at First Union	131.781	2	65.891	136.857	0.00
Years Since First Union	303.316	2	151.658	315.00	0.00
Level of Education	20.209	3	6.736	13.992	0.00
Occupation Before First Union	1.325	3	0.442	0.917	0.432
Explained	4083.231	11	371.203	771.003	0.00
Residual	3984.037	8275	0.481		
Total	8067.268	8286	0.974		

Multiple R = 0.711 R^2 = 0.506

TABLE 5 (Continued)

Multiple Classification Analysis (MCA)

Variable & Category	Number of cases	MCA Coefficients: Unadjusted	MCA Coefficients: Adjusted for Independents & covariate variables
Age at First Union:	(η^2=0.0529, β^2=0.0256)		
1. <20	6630	0.11	0.07
2. 20-30	1591	-0.42	-0.27
3. 30+	66	-0.88	-0.83
Years Since First Union:	(η^2=0.4761, β^2=0.1681)		
1. <10	3251	-0.79	-0.48
2. 10-20	2575	0.19	0.14
3. 20+	2461	0.84	0.48
Level of Education:	(η^2=0.0225, β^2=0.0036)		
1. Illiterate, No School, and Illiterate, Some School	6790	0.05	0.02
2. Can Read and Write	857	-0.06	-0.06
3. Primary	413	-0.26	-0.14
4. Secondary & University	227	-0.79	-0.26

TABLE 5 (Continued)

Occupation Before Frist Union	(η^2=0.0144, β^2=0.0001)		
1. Did not Work	6989	0.03	0.00
2. Professional, Clerical and Sales.	203	-0.69	0.03
3. Agric., Self-Employed, and Agric., Employed by Other	809	0.00	0.03
4. Household Services, Other Services, Skilled Labour, Unskilled Labour and Not STated	286	-0.26	-0.04

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APPENDIX

CROSS TABULATION OF CHILDREN EVER-BORN (PARITY) WITH INDEPENDENT INDICATORS

1. AGE:

Number of Children Ever Born \ Age	15-24	25-34	35+	Total
0-2	1778	990	402	3170
3-5	488	1505	853	2846
6-8	10	639	1271	1920
9+	0.0	85	767	852
Total	2276	3219	3293	8788

Chi-square (X^2)	D.F. $(n_1-1)(n_2-1)$	Significance
3912.760	6	0.00

2. AGE AT FIRST UNION:

Number of Children Ever Born \ Age at First Union	<20	20-29	30+	Total
0-2	2049	1059	62	3170
3-5	2222	611	13	2846
6-8	1714	204	2	1920
9+	806	46	0.0	852
Total	6791	1920	77	8788

Chi-square (X^2)	D.F. $(n_1-1)(n_2-1)$	Significance
613.262	6	0.00

3. YEARS SINCE FIRST UNION :

Number of Children Ever Born \ years since First Union	<10	10-19	20+	Total
0-2	2569	391	210	3170
3-5	987	1324	535	2846
6-8	24	872	1024	1920
9+	0.0	111	741	852
Total	3580	2698	2510	8788

Chi-square (X^2)	D.F. $(n_1-1)(n_2-1)$	Significance
5233.392	6	0.00

4. TYPE OF PLACE OF RESIDENCE:

Number of Children Ever Born \ Type of place of Residence	Urban	Rural	Total
0-2	1416	1752	3170
3-5	1274	1572	2846
6-8	741	1179	1920
9+	274	578	852
Total	3705	5083	8788

Chi-sqaure (X^2)	D.F. $(n_1-1)(n_2-1)$	Significance
61.055	3	0.00

5. LEVEL OF EDUCATION:

Level of Education / Number of Children Ever Born	Illiterate	Can Read and Write	Primary	Secon-dary	Total
0-2	2217	292	161	500	3170
3-5	2159	308	175	204	2846
6-8	1645	192	60	23	1920
9+	769	65	17	1	852
Total	6790	857	413	728	8788

Chi-square (X^2)	D.F.	Significance
508.251	9	0.00

6. RELIGION:

Number of Children Ever Born \ Religion	Moslem	Christian	Total
0.2	2990	180	3170
3-5	2678	168	2846
6-8	1802	118	1920
9+	797	55	852
Total	8267	521	8788

Chi-square (X^2)	D.F.	Significance
0.946	3	0.814

7. OCCUPATION BEFORE FIRST UNION:

Number of Children Ever Born \ Occupation Before First Union	Did not work	Professional, Clerical, Sales	Agriculture	Others	Total
0-2	2461	289	278	142	3170
3-5	2405	96	255	90	2846
6-8	1664	13	199	44	1920
9+	749	4	78	21	852
Total	7279	402	810	297	8788

Chi-square (X^2)	D.F.	Significance
288.677	9	0.00

8. WORK STATUS BEFORE FIRST UNION:

Work Status Before First Union / Number of Children Evern Born	Family Paid Cash, Family Paid Kind, and Family	Other Paid Cash, Other Paid Kind and other Unpaid	Self Employed, Did not work, and Not Stated	Total
0-2	207	444	2519	3170
3-5	194	217	2435	2846
6-8	144	98	1678	1920
9+	54	38	760	852
Total	599	797	7392	8788

Chi-square (X^2)	D.F.	Significance
160.908	6	0.00

9. PARTNER'S LEVEL OF EDUCATION:

Partner's Level of Education / Number of Children Evern Born	Illiterate, No School, and Illiterate, Some School	Can Read and Write	Primary	Secondry and University	Total
0-2	1412	677	271	810	3710
3-5	1339	749	259	499	2846
6-8	1097	528	153	142	1920
9+	496	280	58	18	852
Total	4344	2234	741	1469	8788

Chi-square (χ^2)	D.F.	Significance
460.667	9	0.00

10. PARTNER'S OCCUPATION:

Partner's Occupation / Number of Children Ever Born	Did not work	Professional, Clerical and Sales	Agricultural, self Employed and Agric. Employed by other	Others	Total
0-2	0.0	865	1075	1230	3170
3-5	0.0	621	999	1226	2846
6-8	0.0	287	851	782	1920
9+	0.0	131	400	321	852
Total	0.0	1904	3325	3559	8788

Chi-square (X^2)	D.F.	Significance
169.027	6	0.000

THE EFFECT OF EDUCATION & ECONOMIC ACTIVITY ON SEX DIFFERENTIALS IN EMPLOYMENT IN EGYPT

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1. INTRODUCTION

In Egypt, level of employment[1] varies considerably between sexes, with a noticeable clustering among the familiar divide of place of residence; urban or rural. Thus those who have the highest level of employment are males living in rural areas with average employment proportion of 0.905, while those with the lowest proportion are females living in urban areas with average proportion of 0.742, CAPMAS (1989).

This kind of variation reflects among other things, the interplay of two kinds of differentials; sex differentials in characteristics of the individuals in the labor force, most crucial among them is their level of education, and place, location or labor market differentials in terms of characteristics of jobs available. Males are universally more educated than females and type of economic activities prevailing in the labor market and the level of technology used in them differ between modern (urban) labor markets and traditional (rural) labor markets. The sex differentials in education and place differentials in type of economic activities has been historically linked through the process of modernization; see Bruton (1973) and De Miranda (1979) for a detailed discussion of this and related issues. This process has been characterized by an ever-growing need for labor with a variety of skills and knowledge in the society. On the personal level this implies, that one has to have some form of formal education to participate in the formal job market and to get one's share of the increase in the production of modern goods. Here males and females differ in two aspects. First, education is more evenly spread among males (due to their overall higher level of education) than among females, and thus males has a higher degree of participation in the modern sector than females. Second, within the modern sector, some economic activities demand non-skilled manual workers such as jobs in the construction, manufacturing and transport. These jobs

[1] Level of employment is defined as proportion employed among those who in the labor force.

are usually filled by men who are illiterate and/or with low level of education. For females no comparable jobs are available and hence their participation in the modern sector is much more dependent on a formal education.

Table (1) and (2) show the distribution of Egyptian population 6 years or more by level of education and type of economic activity respectively. In each table the population is divided according to sex, place of residence or both. Comparing the averages for males and females, the discrepancies between the educational levels for the two sexes are noteworthy. The percentages without any formal education are 64% and 78% for males and females respectively, but the percentage illiterate is about 165% higher for females than for male; 62% to 38%. Two things are clear from this table, viz., those who live in urban areas (be males or females) has more education than those living in rural areas and distribution of education levels among females is much more skewed to the right than that for males. Table (2) shows clearly, as discussed earlier, that important sex differentials exist with regard to economic activities. In general the table suggests that males are more comparatively more engaged in economic activities where a higher share of "blue collar" workers is to be expected such as agriculture and mining, manufacturing and construction.

Table (1)

DISTRIBUTION OF POPULATION (10 YRS AND ABOVE) BY LEVEL OF EDUCATION ACCORDING TO SEX AND PLACE OF RESIDENCE, EGYPT 1986

Educational Level	Males			Females			Total Rural	Total	Total
	Urban	Rural	Total	Urban	Rural	Total Urban			
Illiterate	.266	.473	.379	.448	.761	.619	.354	.614	.497
Read and Write	.255	.265	.260	.209	.136	.169	.232	.201	.215
Less than Secondary School	.179	.126	.150	.157	.063	.105	.168	.095	.128
Secondary School and below University	.212	.114	.158	.158	.038	.092	.186	.077	.126
University and above	.088	.022	.052	.029	.002	.014	.059	.013	.034
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Note: Figures may not add to one because of roundings.
Source: Computed using Table (7), CAPMAS (1989).

Table (2)

DISTRIBUTION OF ECONOMICALLY ACTIVE POPULATION (6 YRS+) BY TYPE OF ECONOMIC ACTIVITY ACCORDING TO SEX AND PLACE OF RESIDENCE, EGYPT 1986

Economic Activity	Males			Females			Total Urban	Total Rural	Total
	Urban	Rural	Total	Urban	Rural	Total			
Agriculture and Mining	.143	.665	.437	.027	.399	.121	.126	.653	.407
Manufacturing and Electricity	.227	.074	.141	.129	.065	.113	.212	.074	.138
Construction	.117	.048	.078	.015	.012	.015	.101	.047	.072
Commerce	.130	.035	.077	.067	.042	.060	.120	.036	.075
Transportation	.091	.034	.059	.039	.011	.032	.083	.034	.056
Financial Services	.033	.006	.018	.044	.012	.036	.035	.006	.020
Social Services	.259	.137	.190	.679	.459	.623	.322	.151	.231
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Activities not clearly stated	.063	.062	.063	.057	.221	.105	.062	.070	.067

Note: Figures may not add to one because of roundings.
Source: Computed using Table (6), CAPMAS (1989).

Female economic activities, on the other hand, are predominantly in sectors with relatively more "white collar" occupations such as financing and social services. If we add to this the fact, which will be shown next, that employment rates of females are lower than those of men, then the data in Table (2) seems to confirm that there is little work for females in the low status production sphere. Finally, the table shows that about 10% of all females, 6 years and above, who are economically active work in activities not clearly stated or in the "residual" category. In the rural areas the corresponding percentage reaches 22%, i.e., almost one-quarter of all active females. This can be explained by a double process—the increase of the available labor force and the incapacity of the productive forces in the traditional sector to absorb excess labor.

To sum up, the interplay of sex differentials in education and sector (modern vs. traditional) or place (urban vs. rural) differentials in economic activities has created two kinds of disparities in most developing countries and Egypt is no exception. The first disparity is between those who have some form of education and those who have not, where the former group should have higher employment rates in the job market of the modern sector. The second disparity has to do with the difference in relative shares of economic activities, and their implied occupational status, for those who are employed according to their sex. Systematic studies of the spatial expressions of these two disparities and their relation to employment differentials are lacking despite their useful implications for planning purposes.

This study attempts to fill a gap in the Egyptian literature and to analyze the spatial distribution of sex differentials in employment with particular emphasis on the quantification of the importance of the effect of spatial differentials in education and in type of economic activities on sex-location specific employment levels. Specifically, we pose the following questions:

1) Is the employment differentials due to the different levels of factors known to affect employment such as education and job characteristics?

2) If so, which factors are more responsible for the extent of the differentials?

3) Do variations in these factors entirely explain the sex-location specific differentials or does the nature of the relationships between employment and its covariates differ as well between high employment and low employment areas?

Answering these questions has been preceded by a detailed comparative analysis of the extent of employment differentials. First, a statistical profile for employment has been constructed for each sex-location; male/female and urban/rural. Second, differences in the level of employment has been examined in terms of its statistical significance and the relative contribution of both sex differences and location differences to the overall significance has been assessed.

2. DATA

The data for this paper are taken from 1986 Egyptian Census (November 1986) and represent the socio-economic characteristics of a 20% systematic sample from all Egyptian households, and published by Central Agency for Public Mobilization And Statistics; CAPMAS (1989). All the data used in this paper comes from Tables (5), (6), and (7) which give the distribution of total population according to sex and employment status, type of economic activity and educational status respectively; CAPMAS (1989)[2] . The data are published according to the place of residence (urban/rural) for the 26 governorates in Egypt. Four of these are totally urban giving a total of 48 spatial units. However, due to their relatively very small

[2] Data in these tables represent the inflated estimates for the 20% sample. For a discussion of the estimation procedure used see CAPMAS (1986).

size of population, the 5 frontier governorates are excluded from the analysis. This gives us a total of 38 spatial units and 76 sex-location groups.

3. DESCRIPTION OF THE PATTERNS

Table (3.a) gives the summary statistics for proportion employed of the labor force by sex and location. The figures in the table shows clearly that not only males are more employed than females, overall and regardless of location, but they are also much more spatially consistent. This can be seen from comparing their coefficient of variations (2.2% compared to 8.5% for females) and in particular the range of their proportions (.075 for males and .272 for females). Males living in rural areas have the highest employment proportions while females in urban areas are at the other extreme. This tentatively supports our earlier discussion namely that job opportunities for females in the modern sector are more dependent (unlike males) on their having some kind of formal education, while males are spread over all types of jobs and occupations. The contrast between sex differentials in employment and location differentials is very clearly shown in Table (3.b) which gives the correlation coefficients between employment proportion and illiteracy for different sex/location groups. Spatially there is a negative and strong relation between employment and illiteracy whereas there is a positive and strong relation (especially in the rural areas) for each sex.

Table (3)

a) SUMMARY STATISTICS FOR PROPORTION EMPLOYED BY SEX AND LOCATION, EGYPT 1986

Sex/Location	Summary Statistics					N
	Min.	Max.	Mean	Coeff. of Variation (%)	Median	
T. Males (M)	.862	.937	.891	2.2	.886	38
T. Females (F)	.621	.893	.743	8.5	.735	38
Urban (U)	.677	.899	.811	9.4	.856	42
Rural (R)	.621	.937	.824	12.3	.871	34
Males—Urban (MU)	.862	.899	.880	1.3	.879	21
Females—Urban (FU)	.676	.850	.742	5.5	.728	21
Males—Rural (MR)	.862	.937	.905	2.3	.910	17
Females—Rural (FR)	.621	.893	.744	11.4	.748	17
All observations	.621	.893	.817	10.8	.862	76

b) CORRELATION BETWEEN PROPORTION EMPLOYED AND PROPORTION ILLITERATE BY GROUP

Group	M	F	U	R	MU	FU	MR	FR	T
Corr. Coeff.	.80	.19*	-.83	-.50	.22*	-.27*	.82	.63	-.44

* Not Significant
Source: Computed using Table (7), and Table (5); CAPMAS (1989).

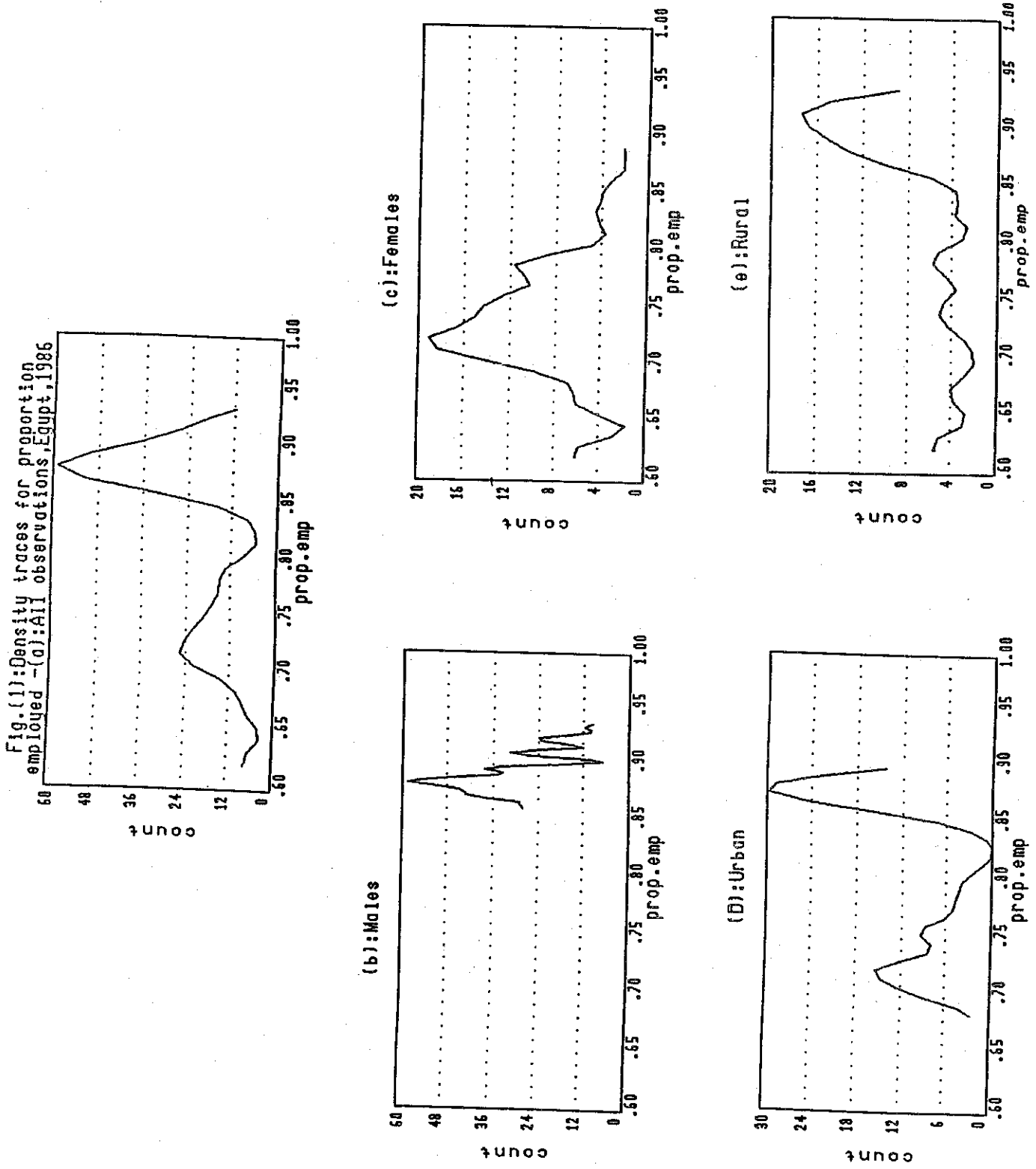
Fig.(1):Density traces for proportion employed -(a):All observations,Egypt,1986
count
prop.emp
(b):Males
(c):Females
(e):Rural
(B):Urban

The exception is the case of females in urban areas where the relation is negative although it is not significant. This contrast is the result of what we have called earlier the interplay between sex differential in education and location differentials in job characteristics.

In rural areas, where labor market is more traditionally oriented and formal education is not a barrier for entering the job market, the relation between employment and illiteracy is positive and strong. The reverse is true with regard to urban areas. In either case, the relation is stronger in the case of males. The important observation is that in rural areas sex plays the role of the so called "suppresser factor" in the relation between illiteracy and employment, whereas in urban areas it plays the role of "intermediate variable". In the first case, the two sub-correlations are larger, in absolute value, than the original correlation (.82, .63 as compared to .50), whereas in the second case the reverse is true. That is, while controlling the effect of sex has resulted in stronger relation between employment and illiteracy, in rural areas, it has weakened the relation to a large extent in urban areas. An interpretation of this observation necessarily demands an examination of the relation between employment and its covariates at a more dis-aggregated level of analysis. This will be done later in the paper.

Figure (1) shows the distribution of employment proportions in the form of a density trace curve for each sex and location group[3] , drawn on the same scale. The figure illustrates the striking difference between the spatial distribution of employment proportions for males as compared to that for females. First, Figures (1.a), (1.d) and (1.e) reveals quite clearly the biomodality of the spatial distribution of employment which takes a much sharper form in the case of urban areas. In each case, the distribution of employment proportions comprises of two sub-

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3 Density trace is now one of the most popular techniques for displaying the distribution of the data. Mathematically, density at any point x is defined as the fraction of data values per unit of measurement that lies in an interval centered at x. The smoothness of the density curve depends on the width of the interval. For a detailed discussion of density curves, see Chambers, et al. (1983).

distribution. The first is much more peaked than the other with data points highly concentrated around its average. The second is much flatter with data scattered over long range. This spatial biomodality is caused by the sex differentials in employment as can be seen in Figures (1.b), and (1.c). As a matter of fact, the actual inspection of data points support this sex-decomposition of employment density curve with one exception in the case of urban areas and four in the case of rural areas.

From Figure (1) it is clear that differences between the two sexes in the same location (urban or rural) are much more pronounced than the differences within the same sex in different locations. But how significant are these differences and which type of differences (sex differences or location differences) contributes significantly more to the overall or total difference? We will now turn our attention to these questions.

4. Significance of Employment Differentials and Its Decomposition

To determine the significance of differences among employment proportions by sex and location on the one hand and the relative contribution of each sub-group to the overall significance on the other, we have utilized a Chi-square test commonly used in the analysis of epidemiological data; Fleiss (1981). The test statistic is used to test the significance of the differences among m proportions, each coming from an independent sample and measures the presence of some characteristics among the subjects in the sample. The formula for the test statistics is given as follows:

$$\chi^2 = \frac{1}{\bar{p}\bar{q}} \sum_{1=1}^{m} n_i(p_i - \bar{p})^2 \qquad \ldots (1)$$

where p_i = proportion of those with the characteristic under consideration in the (i^{th}) sample,

$\bar{p}$ = overall proportion in all samples (number with characteristics in all samples divided by total number of observations).

n_i = size of the (i^{th}) sample,

$\bar{q}$ = $1-\bar{p}$

The test statistic (1) has a Chi-square distribution with (m-1) degrees of freedom.

A very useful property of this test statistic is that it is decomposable. Specifically, if the m samples can be partitioned into two groups, according to a given criteria, the first containing m_1 samples and the second m_2, where $m = m_1+m_2$, then the test statistic given in (1) can be written as follows:

$$\chi^2 = \chi_1^2 + \chi_2^2 + \chi^2_{diff} \quad \ldots (2)$$

where χ_1^2 and χ_2^2 have similar forms to (1), with degrees of freedom (m_1-1), (m_2-1) respectively, and can be used to test the significance of the differences among the m_1 proportions in the first group and among the m_2 proportions in the second group respectively. The third term χ^2_{diff} has the following form:

$$\chi^2_{diff} = \frac{1}{\bar{p}\bar{q}} \times \frac{n_{(1)}\, n_{(2)}}{N} (\bar{p}_1 - \bar{p}_2)^2 \quad \ldots (3)$$

where $n_{(1)}$ and $n_{(2)}$ are the total size of observations while $\bar{p}_1$ and $\bar{p}_2$ are the proportion of those having the given characteristic in the first and second group respectively. χ^2_{diff} has one degree of freedom and can be used to test the significance of the difference between $\bar{p}_1$ and $\bar{p}_2$.

The above approach can be adapted to our case here in a very straightforward manner by letting the (i^{th}) spatial unit (totaling 76) corresponds to the (i^{th}) sample above, the sex/location groups corresponding to the two partitioned groups of samples as appropriate and being employed be the characteristic under consideration. However, since number of observations in each spatial unit (n_i) is very large (it is a population count) all values of χ^2 shown in (2) would be highly significant. Nevertheless, we still could use the decomposable

property of the test statistic to evaluate the relative contribution of differences in each sex/location group to the overall significant differences which is our main concern here. The results of applying this approach to the data in question are reported in Table (4) where Parts (A) and (B) examine the significance for the complete observations, and the rest of the table considers the significance in each sex location group. The following are immediately clear:

a) Sex differentials in employment are much more important in terms of causing the significant differences among employment proportions in Egypt than location differentials. The former accounts for 71% of the total value of Chi-square, while the latter accounts only for 9%. On the other hand, the variations within each specific location (urban/rural) is very high which testifies to the heterogeneity of employment proportions. For example, differences among rural proportion contributed about 55% of overall significance differences.

b) Controlling for location (parts c and d in the table), sex differentials contributes about 85% of the significance differences within urban and rural areas (c.3 and d.3). However, there is an interesting difference; in urban areas male employment proportions are relatively more homogenous than female proportions, the reverse is true with regard to rural areas. Note that controlling for location, that is, by examining the significance of differences within each location separately, means that differences in proportions results mainly from differences in personal qualifications between the two sexes, especially with regard to their level of education, and the extent of the match between these qualifications and type of economic activities prevailing in the areas.

Table (4)

ANALYSIS OF SIGNIFICANCE OF DIFFERENCES AMONG PROPORTIONS EMPLOYED BY SEX AND LOCATION, EGYPT 1986

Source of Significance	Notation / Value	No. of Spatial Units	Contribution to Overall Significance (%)
A. Differences Among all Proportions:	χ^2_{All} =346.000	76	100
*A.1) Differences among Urban Proportions	χ^2_U =125,457	42	36.2
*A.2) Differences among Rural Proportions	χ^2_R =189,541	34	54.8
*A.3) Differences between Average Proportion in Urban and Rural Areas	χ^2_{U-R} = 31,002		9.0
B. Differences Among all Proportions:	χ^2_{All} = 346.000	76	100
B.1) Differences among Male Proportions	χ^2_M = 41,306	38	11.9
B.2) Differences among Female Proportions	χ^2_F = 60,013	38	17.3
B.3) Differences between Average Male and Female Proportion	χ^2_{M-F} =244,681		70.8
C. Differences Among Urban Proportions:	χ^2_U =151.516	42	100
C.1) Differences among Urban Male Proportions	χ^2_{MU} = 3,227	21	2.1
C.2) Differences among Urban Female Proportions	χ^2_{FU} = 18,297	21	12.1
C.3) Differences between Average Urban Male and Female Proportions	χ^2_{MU-FU} =129,992		85.8
D. Differences Among Rural Proportions:	χ^2_R =182.840	34	100
D.1) Differences among Rural Male Proportions	χ^2_{MR} = 23,857	17	13.0
D.2) Differences among Rural Female Proportions	χ^2_{FR} = 6,622	17	3.6
D.3) Differences between Average Rural Male and Female Proportions	χ^2_{MR-FR} =152,361		83.4

Table (4) Contd...

ANALYSIS OF SIGNIFICANCE OF DIFFERENCES AMONG PROPORTIONS EMPLOYED BY SEX AND LOCATION, EGYPT 1986

Source of Significance	Notation / Value	No. of Spatial Units	Contribution to Overall Significance (%)
E. Differences Among Male Proportions:	χ^2_M = 4,557	38	100
*E.1) Differences among Urban Male Proportions	χ^2_{MU} = 3,231	21	7.0
*E.2) Differences among Rural Male Proportions	χ^2_{MR} =24,116	17	52.5
*E.3) Differences between Average Urban and Rural Male Proportions	χ^2_{MU-MR} =18,610		40.5
F. Differences Among Female Proportions:	χ^2_F = 34,682	38	100
F.1) Differences among Urban Female Proportions	χ^2_{FU} = 11,801	21	34.0
F.2) Differences among Rural Female Proportions	χ^2_{FR} = 18,888	17	54.5
F.3) Differences between Average Urban and Rural Female Proportions	χ^2_{FU-FR} = 3,993		11.5

* Note that the value of χ^2 statistics in (A.1) differ from that of (C) although they both measure the extent of differences among urban proportions. The reason is that the value of product term (pq) which appears in the denominator of each of them is a group specific and it differs according to whether the group is the whole group like in the case of (C) or a sub-group like in the case of (A.1).

For each sex more than half of the significance of the difference is due to the difference among proportions in rural areas; (e.2) and (f.2). However, there is an important difference. In contrast to males, difference in proportions for females in urban areas are relatively much more significant. Thus, while differences among male proportions combined contributed about 60% of the total significance, the corresponding contribution is about 90% for females. Thus, another aspect of the sex differential in employment and it testifies to the fact that female employment (unlike male employment) is sensitive to the size of the so called residual or not clearly stated type of activities which in turn differs greatly between one spatial unit and another.

5. The Effect of Differences in Levels of Education and Type of Economic Activities on Employment Differentials

The results of significance analysis in the preceding section together with the shape of density curves in figures (1.d) and (1.e) show clearly the contrast in the variation of employment proportion both, between, and within the sex-location specific groups. To understand how those variations are related to employment covariates; namely levels of education and types of economic activities, and the relative importance of each of them, we have performed a series of regression analysis with proportions employed as the dependent variable and the covariates as the independent variables. The results are shown in Table (5). The focus in the analysis was on the extent of employment differentials and how they were affected by the covariates and not (as is normally the case) on the employment proportions *per se*. The effect on employment differentials was assessed by including a dummy variable as an additional independent variable which was used as an indicator for each sex-location specific group. By examining the changes in the size and sign of the indicator's coefficient we were able to assess the effect on employment differentials. For emphasis, the coefficients of the four indicator variables and the corresponding t-values were enclosed within a rectangle. In Panel A the four indicators for the different sex-location specific groups are the only explanatory variables. All the coefficients are highly significant indicating the existence of significant difference in the extent of employment between each group and the rest of Egypt with males having above average and females having below average employment. This is in accordance with the previous discussion. However, the size and significance of these differences change as alternative groups of employment covariates are added in Panels B to D.[4]

4 Due to the high correlations within each group of covariates a separate forward stepwise regression was done for each group with employment proportions as the dependent variable and the covariates as the independent variables. The variables included in the analysis reported in Table (5) are the ones that has been retained by the stepwise regression.

Table (5)

REGRESSION ANALYSIS FOR EMPLOYMENT SHOWING THE EFFECTS OF CONTROLLING OTHER COVARIATES ON COEFFICIENT OF THE SEX-LOCATION SPECIFIC INDICATOR

Explanatory Variables	SEX-LOCATION SPECIFIC GROUP* F-U (1)	M-U (2)	F-R (3)	M-R (4)
A. Indicator (D) Only**	-.104 (-5.38)	.087 (4.27)	-.094 (-4.3)	.113 (5.51)
r^2	.281	.197	.199	.291
B. Indicator plus Education Variables				
Indicator (D)	-.076 (-3.81)	.069 (2.76)	-.086 (-2.78)	.092 (3.94)
Read and write	-.682 (-3.68)	1.019 (5.81)	.793 (4.23)	.366 (1.60)
< Secondary School	-.170 (-.60)	-.966 (-3.86)	-1.254 (-4.27)	-.298 (-1.14)
Univ. and higher	-.516 (1.75)	.428 (1.25)	.963 (3.42)	1.142 (4.20)
r^2	.524	.483	.483	.530

* F = Females, M = Males, U = Urban, R = Rural.
** D = Dummy Variable with D = 1 for the group under consideration and D = 0 for the rest of the observations.

Table (5) Contd...

Explanatory Variables	F-U (1)	M-U (2)	F-R (3)	M-R (4)
C. Indicator (D) Plus Activity Variables				
Indicator (D)	.089 (3.93)	.002 (.16)	-.128 (-7.46)	.031 (1.72)
Not clearly stated	-.180 (-2.76)	-.255 (-3.67)	.268 (3.08)	-.182 (-2.26)
Fin. & business	1.264 (2.62)	1.599 (2.68)	.762 (1.87)	2.19 (3.64)
Social services	-.488 (-11.92)	-.353 (-11.28)	-.308 (-15.24)	-.337 (-12.24)
r^2	.808	.766	.869	.775
D. All Variables				
Indicator (D)	.100 (4.30)	-.009 (-.45)	-.137 (-7.25)	.043 (2.07)
Read and write	.063 (.44)	.098 (.59)	-.032 (-.26)	.003 (.02)
< Secondary School	.245 (1.18)	.222 (.84)	-.147 (-.81)	.309 (1.30)
Univ. and higher	.194 (.97)	.040 (.17)	-.059 (-.36)	.117 (.53)
Not clearly stated	-.028 (-.29)	-.132 (-1.21)	.230 (2.41)	-.028 (-.24)
Fin. & business	.529 (.88)	1.387 (2.15)	1.023 (2.1)	1.742 (2.67)
Social services	-.471 (-10.61)	-.343 (-8.92)	-.320 (-12.01)	-.307 (-8.29)
r^2	.821	.733	.872	.786

Controlling for education variables; Panel (B), has resulted in a decrease in the absolute size of all indicator's coefficients which implies a narrowing of the size of the differentials. However, the size of the decrease is small ranging from 9%

from its original value in the case of females in rural areas (group (3)) to 27% in the case of females in urban areas (group (1)).

Thus, only a small part of employment differentials between each specific group and the rest of Egypt can be explained by differences in levels of education. Specifically lower (higher) employment for females (males) can be partly explained by their relatively lower (higher) proportions in "read and write" category, and in "university or higher degree" and their relatively higher (lower) proportions in "less than secondary school" category. Overall differences in levels of education plus the differential indicator explain about 50% of the variation in employment in each case.

Panel (C) reveals interesting aspects regarding the association between the type of economic activities and differentials in employment. First, spatial distribution of economic activities is much more strongly related to spatial distribution of employment levels than is the case with regard to education. This can be seen both from the high values of (r^2), which reached 87% in the case of rural females, and the profound effect they had on employment differentials once they have been controlled. For males, controlling for the effect of economic activities has resulted in a decrease in the size of the differentials, i.e., the size of the regression coefficient, by about 98% in urban areas and 75% in rural areas. Thus, almost all of employment differentials (the remaining differentials has become non-significant) between each male-specific group and the rest of the population can be explained by the different types of activity they engaged in. Thus, areas with relatively high male employment are characterized by smaller size of "residual" activities and of social services and a larger size of financial and business activities.

In contrast, female employment differentials has shown a completely reversed pattern and especially so for females working in urban areas (group (1)). Unlike males, employment differential has increased, in absolute terms, for rural females.

This means that employment differential would have been even greater (with even lower female employment) had it not been for the more job opportunities in both the not stated and financial and business service categories. Controlling for economic activities, has reversed the sign of the employment differential indicating a higher employment level for urban females than for the rest of the population (.089 higher instead of .104 lower). This implies that female employment in urban areas would have been much higher had it not been for their higher proportions in both not stated and social service activities and their lower proportion in financial and business activities which are the characteristics of areas with low employment level.

Finally, we have combined the two covariate groups in Panel (D) to see which effects dominate. The results are very similar to that of Panel (C), i.e., when only the economic activity group was entered in the equations, which testifies to the dominance of effect of economic activities.

6. Estimating the Amount of Sex Employment Differentials due to Variation in Independent Variables

The above analysis assumes that in each case both the specific sex-location group and the rest of observations have the same type of relationships explaining employment variations. However, given the differences in labor market environment between the two sets of observations, the nature of the relationships could differ as well. To assess the relative role of differences in levels of independent variables versus the role of differences in relationship we have to allow for different relationships. Ideally a separate regression equation should be fitted for each sex-location group. But since this procedure will result in large reduction in the number of observations in each case, we have decided to investigate only the two sex-groups (total males and total females) regardless of location. A separate regression equation was fitted (without the dummy indicator)

for each sex using the six independent variables reported in Table (5) above, and the results used to decompose the size of the sex differentials as follows:

Let $\bar{E}_{m,m}$ = the estimated mean employment proportion for males using both the estimated regression coefficients and the mean values of the independent variables observed for males.

$\bar{E}_{m,f}$ = the estimated mean employment proportion for females using the estimated regression coefficients for males and the mean values of the independent variables observed for females.

$\bar{E}_{f,m}$ = estimated mean employment proportion for males using the estimated coefficients for females and the mean values of the independent variables observed for males.

$\bar{E}_{f,f}$ = the estimated mean employment for females using both the estimated coefficients and the mean values of the independent variables for females.

Then we have,

$$\text{Total differential} = \bar{E}_{m,m} - \bar{E}_{f,f}$$

$$= (\bar{E}_{m,m} - \bar{E}_{m,f}) + (\bar{E}_{m,f} - \bar{E}_{f,f}) \quad \ldots (4)$$

$$= (\bar{E}_{f,m} - \bar{E}_{f,f}) + (\bar{E}_{m,m} - \bar{E}_{f,m}) \quad \ldots (5)$$

Thus,

$$\text{Total differential} = \left[\begin{array}{l}\text{differential due to}\\ \text{differences in employ-}\\ \text{ment covariates.}\end{array}\right] + \left[\begin{array}{l}\text{unexplained residual}\\ \text{due to differences}\\ \text{inestimated coefficients.}\end{array}\right]$$

In equation (4), mean values of independent variables for females are used as weights while in equation (5), the weights are those of males.[5] The unexplained residual reflects the influence of factors not incorporated explicitly into the regression equations and is assumed to be due at least in part to socio-cultural factors that influence the choice of one sex over the other for a given job. The results are reported in Table (6), where Panel (A) of the table gives the estimated

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5 This decomposition is subject to the familiar index number problem since the same differential can be decomposed under the alternative assumption that the estimated male structure applied to both sexes. The true structure that exists for both sexes is unknown. Nevertheless, it is assumed that the range of estimates obtained under these alternative assumptions includes values based on the unknown true employment relationships.

coefficients for males and females, and Panel (B) show the results of the decomposition. Only about 40% of total mean differences in employment (regardless of the weights used) can be attributed to variation in employment covariates. The other 60% presumably reflect non-labor market factors as we mentioned above. However, a detailed analysis using micro-level data is needed to investigate this issue, more fully.

Table (6)

ESTIMATED MEAN EMPLOYMENT LEVEL USING ONE SEX'S REGRESSION CO EFFICIENTS AND THE MEAN VALUES OF THE OTHER SEX'S VARIABLES

A. Estimated Regression Coefficients for Males and Females
(Dependent Variable: proportion employed)

Independent Variables	Males	Females
	Coefficient (t-value)	Coefficient (t-value)
Read and write	-.1308 (-2.35)	-.1147 (-.36)
Less than Secondary School	-.1872 (-2.35)	-.1386 (-.22)
University and higher	-.1081 (-1.76)	2.089 (1.48)
Not clearly stated activities	-.1642 (-1.88)	.3593 (1.87)
Financial & business activities	.5770 (2.13)	2.464 (2.30)
Social services activities	-.2038 (-5.65)	-.1123 (-1.14)
Intercept	1.001 (57.32)	.7144 (8.96)

B. Decomposition Results

Regression Coefficients Estimates for	Mean Values of Independent Variables for Males	Mean Values of Independent Variables for Females
Males	$\bar{E}_{m,m} = .8971$	$\bar{E}_{m,f} = .8459$
Females	$\bar{E}_{f,m} = .8170$	$\bar{E}_{f,f} = .7642$
Total Differential	$\bar{E}_{m,m}-\bar{E}_{f,f} = .1329$ (100%)	
	Using Male Coefficients	Using Female Coefficients
Differential due to differences in independent variables (%)	$\bar{E}_{m,m}-\bar{E}_{f,f} = .0512$ (38.5%)	$\bar{E}_{f,m}-\bar{E}_{f,f} = .0528$ (39.7%)
Differential due to differences in estimated coefficients (%)	$\bar{E}_{m,f}-\bar{E}_{f,f} = .0817$ (61.5%)	$\bar{E}_{m,m}-\bar{E}_{f,m} = .0801$ (60.3%)

7. SUMMARY AND CONCLUSIONS

This study has attempted to describe and analyze the spatial distribution of employment differentials by sex and location with particular emphasis on the quantification of the importance of the effect of spatial differentials in education and in economic activities on the sex-location specific employment level. Utilizing the decomposable property of a Chi-square test statistics we have been able to assess the relative contribution of differences in employment proportions between and within the different sex-location specific groups to the significance of differences among the complete set of the proportions.

Next, we have examined how the relationship between sex-location and employment changes when other factors are controlled, by estimating several regressions, one for each sex-location group. We first estimated a regression that include only an indicator for whether the observation belong to the specific group in question. We then added two set of employment covariates to assess their effect on employment differentials between the given sex-location group and the rest of Egypt. The two sets represent a pre-selected variables that describe levels of

education and type of economic activities prevailing in different spatial areas in Egypt. A final regression combined these two sets of factors to examine the full impact of controlling them on the size and significance of the employment differentials between the sex-location specific group and the rest of Egypt.

There is a considerable spatial variability in employment in Egypt and the observed pattern suggests clear links between this variation and levels of education and types of economic activities. This link between employment and its covariates was shown to be sex-specific with larger differentials within urban areas. The results in this Paper has produced evidence that regional differences in the level of employment exists beyond those which can be attributed to differences in levels of determinants. A fuller examination of this finding demands a micro-level analysis with an explicit consideration of non-labor market factors. This is a subject for future research.

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