LABOR PARTICIPATION OF ARAB WOMEN: ESTIMATES OF THE FERTILITY TO LABOR SUPPLY LINK

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Abstract

The paper has two objectives. The first is to review salient trends in the fertility of women, their education, formal and informal participation and status over the past two decades. The second is to examine at the micro level the determinants of labor participation for a set of Arab countries. A major focus of the analysis is the fertility-labor link. Do high fertility rates impede participation? What role does education play in each? Methodologically, the paper applies a two-step econometric model that consists of a Poisson maximum likelihood count equation and a dichotomous probit equation. The salient findings of the paper are: First, fertility and participation are inversely related and the link is strong in all Arab countries under review. Second, age at marriage, women's education, infant mortality and preference for male offspring are important determinants of fertility. Reduced infant mortality rate is associated with fertility reduction. Third, a rise in wage increases the opportunity cost of having children and therefore leads to a decrease in fertility. Fourth, increased resources at the household level reduce women's participation, ceteris paribus. Finally, education is an important pathway to effective engagement of Arab females in formal market activities.

ملخص

لهذه الورقة هدفان، يتمثل أولهما في عرض الاتجاهات البارزة لخصوبة المرأة، وتعليمها، ومشاركتها الرسمية وغير الرسمية، ووضعها الاجتماعي، خلال العقدين المنصرمين. ويتمثل ثانيهما في بحث محددات مشاركة العمالة في مجموعة من الدول العربية على مستوى الاقتصاد الجزئي. ويركز التحليل بوجه خاص على العلاقة بين الخصوبة والعمل: هل تحد معدلات الخصوبة المرتفعة من المشاركة؟ وما الدور الذي يلعبه التعليم في كل منهما؟ ويعتمد المنهج المتبع في الورقة على نموذج قياسي من خطوتين يتكون من معادلة الامكان الأعظم لـ "بواسون" ومعادلة بروبيت الثنائية (dichotomous probit equation). وتتلخص أهم نتائج الدراسة فيما يلي: أولاً، هناك علاقة عكسية بين الخصوبة والمشاركة، وتعتبر العلاقة قوية في كل الدول العربية محل الدراسة. ثانياً، يعد سن الزواج، وتعليم المرأة، ووفيات الأطفال، وتفضيل الذرية الذكر، من المحددات الهامة للخصوبة. وهناك ارتباط بين تخفيض وفيات الأطفال وتخفيض الخصوبة. ثالثاً، إن زيادة الأجور ترفع من تكلفة الفرصة البديلة لانجاب الأطفال مما يؤدي إلى خفض الخصوبة. رابعاً، تؤدي الزيادة في الموارد على مستوى الأسرة إلى الحد من مشاركة المرأة، مع بقاء المتغيرات الأخرى على حالها. وأخيراً، فإن التعليم سبيل هام إلى مشاركة المرأة العربية في أنشطة السوق الرسمي.

I. INTRODUCTION

This paper has two objectives. The first is to review the economic participation of Arab women and the underlying changes in the status of women during the past two decades. While policy makers and analysis commonly list education, income, infant mortality rates as causes of the persistence of the lagging fertility and women participation rates, such identification rests on surprisingly thin evidence. The macro part discusses the issue of joint-determination between fertility and labor supply. Secondly, the paper applies a two-step econometric model in order to estimate the fertility-to-labor supply link utilizing micro-level data for a group of four Arab countries. In the process, a number of hypotheses are tested drawing upon labor market theories and empirical techniques from the literature which have limited previous applications in the settings of Arab economies. The data for the macro analysis are drawn from government and international sources. Micro-level data are discussed in the second part of the paper. Before proceeding to the remainder of this study, it is necessary to briefly mention the problems of data collection on women's employment in the Arab countries. Research has documented the instability and under counting of female labor supply estimates. The shortcomings of official data sources such as labor survey and population censuses has been pointed out in detail elsewhere (Anker, 1990; Moujaber, 1985). Here it will suffice to state that women's economic participation is greatly underestimated in official statistics mainly due to unsuitable methods of data collection, inappropriate definitions of activity, and the cultural inhibition in admitting to women working. The plan for the remainder of this article is as follows. Section II provides an aggregate profile of women's labor participation and discusses supply and demand constraints of Arab women labor participation. The section also presents the two-step (T-S) model for estimating the fertility-to-labor supply link. An outline of the data sets used in the micro analysis is presented in section III. Empirical findings are presented in section IV and the principal conclusions and policy implications drawn from the paper are presented in section V.

II. FORMAL SECTOR EMPLOYMENT

In the formal sector only 17 percent of Arab women participate in market activities. They tend to be young, and relatively well qualified and unmarried. Female labor force participation drops off sharply with marriage, and then rises again among older women who are widowed, divorced or separated. In the mid 1990s, women's share of the labor force in the Arab countries was lowest among the six developing regions of the world. Comparative regional data reveal that as a proportion of men's activity rate, Arab women's rate is 21 percent. This is discernibly lower than the 80 percent female-to-male activity rate which the East Asian region has achieved. It is below the Sub-Saharan rate of 56 and lower than the corresponding rate for Latin America 37 and South Asia, 35 (UNDP, 1995:2.6). While still low by international standards, women's participation has increased appreciably in many Arab countries relative to the levels that prevailed in the early 1970's. Especially high increases were reported in Syria, Kuwait, Sudan and Tunisia where female labor gain topped that of men.

Distribution of Arab women across primary, secondary and tertiary sectors is shown in table (1). The degree of occupational segregation is quite extreme, with females comprising only a small minority in most occupations. Almost half the women in the formal sector are confined to lower level white collar jobs such as typists or clerks. At the same time, women tend to be under-represented in professional and managerial positions. In the manual categories, some women are found in unskilled jobs such as cleaners or messengers but very few females work as skilled or even semi-skilled blue-collar workers. The existence of occupational segregation, as noted in Egypt, Kuwait, Jordan, Algeria, Saudi Arabia, Bahrain among others, is recognized in the expressed preference of both workers and employers for certain types of jobs by men or women. These preferences are a matter of shared societal norms. It is not clear how these preferences are shaped and what forces contribute to their evolution. Economists have no theory of preference evolution and their temporal changes. (World Bank, 1993; Ibrahim, 1989).

Arab women are concentrated in the services sector; they constitute, as a proportion of the total female labor force, 67 per cent in Egypt, 50 per cent in Iraq, and 45 per cent in the Syrian Arab Republic. This proportion increases in the Gulf countries and Jordan; it reaches 92 per cent in Bahrain, 89 per cent in Jordan 99 per cent in Kuwait, 98 per cent in Qatar, and 94 per cent in the United Arab Emirates. Within the services sector, the proportion of female labor is highest in social and personal services; in the 1980s it reached 60 per cent in Bahrain, 56 per cent in Egypt, 78 per cent in Jordan, 92 per cent in Kuwait, 98 per cent in Qatar, and 91 per cent in the United Arab Emirates (Escwa, 1992).

A few Arab women hold administrative and managerial positions. In the Gulf countries of Kuwait and the UAE 5.2 and 1.6 of all managerial and administrative positions are held by women. In Algeria and Tunisia respectively 6 and 7 percent of all administrative slots are held by women. The respective percentages in Syria and Iraq are 8 and 10. The corresponding figure for Egypt is 10 percent; 2.4 percent in Sudan and 5 percent in Jordan. These percentages fall well below the 40 percent mark in advanced countries and 15-20 percent for developing countries. A higher share obtains for women who work in professional and technical positions including nursing, teaching, social and clerical work. Their share to total professional and technical workers ranges from 18 percent in Tunisia to 26-28 percent in Syria and Egypt respectively and over 33 percent in Jordan and Iraq (UNDP,1995:3.5).

Over a million Arab women work in industry. They are concentrated in Egypt, Morocco, Syria and Tunisia, particularly in textiles, weaving and ready-made clothing, and to a lesser extent in chemical industries, food-processing, and metallurgy (El-Solh and Chaalala,1992). In Egypt, for example, textiles, clothing and leather rank highest with females accounting for 58 per cent out of the total number of workers in manufacturing industries and 50 per cent of the total industrial female labor force; in Jordan 70 per cent and 62 per cent, and in the Syrian Arab Republic 74 per cent and 64 per cent, respectively. The remaining female labor force is distributed among the chemical, mineral and food industries. Women are allocated jobs in the industrial sector that require either traditional female skills or a great degree of precision and patience, qualities that are usually associated with women (Moghadam, 1993).

Marginal labor market share and modest educational and occupational attainments translate into a small share in total earned income. In most Arab countries women's share of earned income is well below 20 percent. The shares for Bahrain and Saudi Arabia are 12 and 7 percent respectively. In Iraq the share of women in total earned income is 17.7 percent; 16 percent in Morocco; 18 percent in both Kuwait and Sudan and 22 percent in Lebanon. These small shares also suggest that women's work in market activities is undervalued; that is, women's productive characteristics are not rewarded equally with men's identical productive attributes. Empirical evidence based on micro-level data provide some support for this possibility (UNDP,1995; Al-Qudsi, 1993; Cohen and House, 1993).

II.1 Informal Sector Participation

Existing data do not reflect the real extent of female participation since the work of women in the formal sector only is accounted for. Their participation in the informal industrial sector, such as income-generating at-home production (sewing traditional handicrafts, food production, etc.) is not covered. Women engaged in informal sector jobs tend to belong to disadvantaged classes with low educational attainment and poor economic conditions. They are predominantly young whose households are recent migrants from rural areas to urban centers. In Egypt, an Escwa-sponsored study revealed that a large but unidentified proportion of women find employment in the informal sector(ESCWA, 1989). The majority, 80 percent, belong to poor income strata with little or no education and fall in young age groups-- 14-34 years of age. More than 50 percent of informal sector female workers are originally migrants from rural areas and belong to families that had recently migrated to urban centers.

Informal sector employment is also widespread in agriculture. Official statistics indicate a low participation rate for Arab women even in countries of the region where agriculture is considered a major economic activity. This is due mainly to technical problems resulting from the concepts, methodologies and tools of data collection. The activities of women working for the family without a wage are not included in the data, though they are a substantial contribution to family income. In Egypt f or instance, where 1990 figures show women comprising 11 percent of the total labor force, samples of rural households in Lower Egypt revealed that half the wives plowed and leveled the land, and between 55 and 70 percent were involved in agricultural production. In Upper Egypt, between 34 and 41 percent were involved in agricultural production and 75 percent were involved in animal husbandry (UNDP,1990). The majority of women working in agriculture are not paid workers. A study on a village in Egypt revealed that women working in family farms without wages constitute about 60 per cent of the village female labor force. They usually work in agricultural production activities related to their housework. In Morocco the number of unpaid women workers is quite high representing about 84 percent of all rural female workers. In Tunisia, the corresponding figure is 74 percent (ALO/UNDP/ILO, 1993). In Syria, nearly 40 percent of all active women in the rural and urban sectors combined are unpaid workers (Al-Safadi 1993).

Under traditional division of labor in rural Yemen, women perform a wide range of economic tasks. Women take care of chickens and cows. They let chickens out in the morning feed them protect them from theft or disease and provide places for the eggs to hatch, and collect the eggs. Some women raise cows. They keep them in sheds, watch their health and collect alfalfa and other food for them. Women also milk cows and use their milk to produce a variety of products including cheese, butter and the like. Women also work in agricultural fields in grain production by preparing the soil, planting seeds, applying fertilizers and harvest. In Saudi Arabia women's agricultural work continue to be a significant component in such crops as wheat, alfalfa cutting and some work related to palm trees. All their activities are family-based. Some Saudi women work in the crafts production for sale in the souk-curb market- where women sellers tend to be above the age of 40, poor, illiterate, and are either married or divorced or widowed since community norms rule out unmarried young women selling in the market (Altorki,1992).

II.2 Constraints to Employment

Employment of Arab women is constrained by demand and supply factors. Demand-side constraints to female employment are, to some extent, a part of the low levels of labor absorption in the Arab economy affecting both male and female labor force members. This is partly a reflection of the macro-level problem of increasing capital-intensity in the economy and partly a reflection of the inefficiency of resource use. For instance, in the 1980s the efficiency of investment crudely measured by the incremental capital-output ratio in Arab economies hovered around 6 while the corresponding ratio in newly industrialized countries (e.g. Korea, Singapore) was about 3.(Clawson, 1992; Diwan and Squire, 1995). In several Arab countries the incremental capital-output ratio declined during the period 1970-1987. Jordan's ICOR was 4.5 in 1971 but by 1987 it had jumped to 7.15. For Egypt the ratio moved upwards from 2.38 to 5.5 and the Tunisian ICOR increased from 4.1 to 8.22 (Gelos, 1995).

During the past twenty years, demand for manpower lagged behind the rapid labor supply growth and sectoral growth failed to cope with the large numbers of new labor market entrants. Population growth in urban labor markets averaged about 3.5 percent while industrial and services sectors grew on average by less than 1 percent (Karshenas,1994). Sluggish growth of the industrial and services sectors is partially due to the fact that many Arab economies followed import-substitution policies that insulated both efficient and inefficient firms from exposure to external competition and imports of new technology were hindered. These trade policies may have caused productivity to grow at lower sustainable rates than would have been possible had more competition and export-led policies been pursued.

In addition to its direct effect on labor demand, the high population growth strained the ability of the education system to provide adequate education. In several Arab countries, high population growth led to overcrowding of classes and over-burdening of teachers, while at the same time declining real incomes undermined teachers' morals, encouraging absenteeism and the search for supplementary sources of earning and support. Since education is an important pathway for female employment in the formal sector, population growth can directly reduce the effective (size and quality) investment in female education and thereby lower women's economic participation.

A third dynamic constraint is the role of public sector where employment policies may have also adversely affected Arab economies productivity growth and decelerated temporal labor demand expansion. In most countries the public sector has temporally increased its share of total employment through guaranteed employment schemes, the security of lifetime employment and its attractive package of benefits including its generous social security schemes. This may have influenced labor productivity in two ways: the first is associated with measurement problems of public services, the second with increased bureaucracy and regulation, which has negative effects on productivity in the private sector.

During the 1970s and early 1980s, excess labor demand in the GCC countries influenced sending countries' domestic demand for female employment. Migratory trends created shortages in the labor markets of the sending countries, resulting in some cases in the agricultural sector to be dominated by female workers. While men looked for other, more lucrative opportunities in the non-farm sector abroad, women were increasingly left with the responsibility of managing farm production. In some countries, the working-age population in the rural areas came to dominated by women. In Egypt, farm labor markets were transformed by the regional oil boom. Nearly 64% of all rural migrants worked in agriculture before going abroad and virtually 99% of rural migrants were male. About 30% of the total male agricultural labor force participated in international migration at some point during the 1980s. (Richards, 1994).

International migration that occurred contributed to increasing capital intensity in the region and reduced labor absorption prospects. The rise in wages in the GCC countries attracted some of the best vintages of human capital in such countries as Jordan, Egypt, and Sudan and induced wages in sending countries to rise as well. With highly mobile labor and increased wages to cost of capital, producers reacted by employing more capital relative to labor. This reaction was facilitated by access to cheap credit due to regulated interest rates. In addition, the emigration process led to replacement of leavers with less qualified employees, and reduced their abilities of expanding their productive sectors (Gelos, 1995).

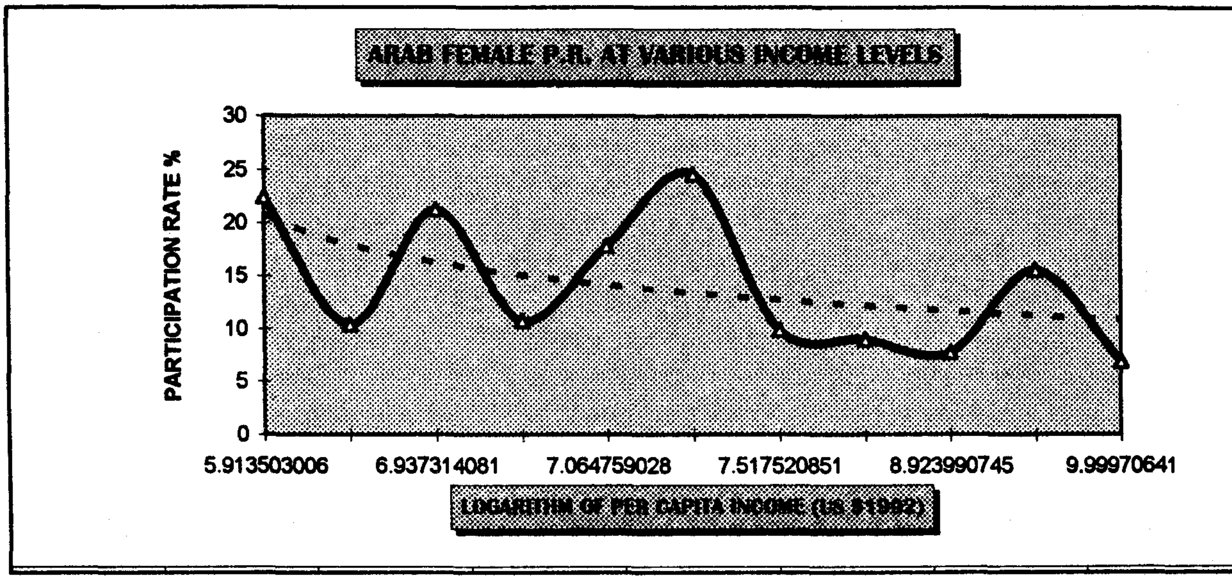
On the supply side, the low participation in modern sector is attributed to low levels of education and skills; high fertility rates; cultural restrictions and household responsibilities. The persistence of gender disparities in education are a major obstacle to improving the position of women in the labor market. The neoclassical theory considers education to be one of the key determinants of women entering the labor market. The higher the level of education, the greater is women's participation in the labor market (Becker, 1974, Mincer

1980). Current records show that Arab women's educational attainment trails men's: As of 1990 nearly 62 percent of adult Arab women were illiterates (the corresponding ratio among men was 36 (UNESCO 1991).

Low educational attainment should not however conceal the fact that young Arab women have achieved impressive progress in acquiring education. During the past two decades, the overall adult literacy rate nearly doubled in the Arab countries, rising from 30 percent in 1970 to 54 percent in 1992. The combined primary and secondary enrollment increased nearly sixfold, from 8 million to 46 million, between 1960 and 1991(UNDP, 1995). Currently more than four-fifths of all school-aged girls attend primary school, up from an average of 55 percent just two decades ago. Secondary education still lags behind, but the increase in the last 25 years has been rapid. Although the gap between enrollment rates of males and females has declined, substantial inequalities still remain, table (2). In 1992 the female/male enrollment ratio was 92 at the primary level of education, 77 and 65 at the secondary and tertiary levels respectively. We should keep in mind however that enrollment rates do not convey the true picture of the gender gap since the drop out rates are significant and are higher for females. For instance, Ibrahim (1989) reports that the drop-out rate for Egyptian primary-school girls is in the vicinity of 30%. In the Gulf countries, the drop-our rates tend to be smaller for primary education but rise to as high as 20% for high school females (El-Sharah, 1987). Some females still escape the educational system altogether. In Bahrain, for instance, Fakhro reports that nearly 20 percent of the females in the age group 5-19 do not attend school.

II.3 Participation and Income Level

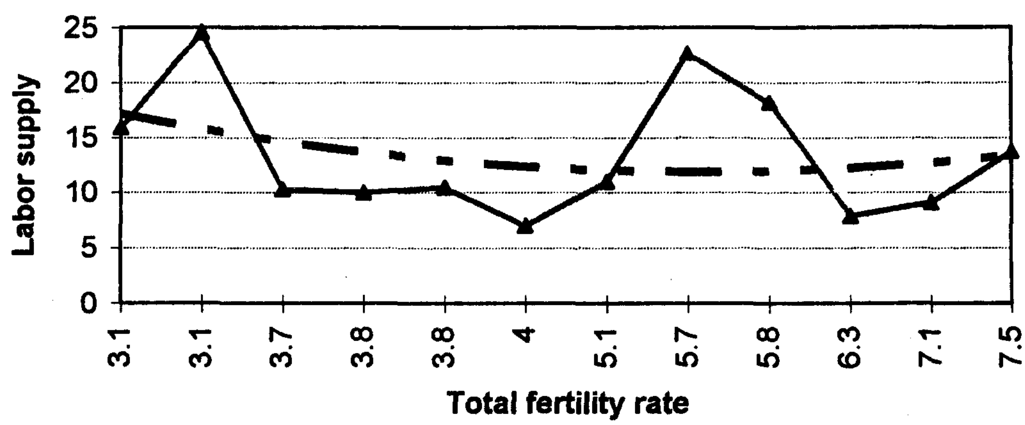
Can women's participation be predicted with reference to an aggregate economic indicator such as per-capita income? Some studies have suggested that there is U-shaped or perhaps boomerang-shaped relationship between level of development and female participation. Thus, female participation rates tend to fall from a high 30-50 percent range at low-income levels to 10-30 percent at the low end of what the World Bank describes as the group of middle-income countries. The participation rate recovers at higher income levels (Tumham, 1993). In a sample of eleven Arab countries the relationship between the logarithm of per capita income and female participation is depicted in chart (1). The chart suggests an oscillating pattern of female participation and the dashed curve shows the trend derived from a simple regression equation capturing the relationship between participation and the logarithm of per capita income in the eleven Arab countries. For countries with per capita income in the range of $600-2000 the rate is about 10 percent; dips for higher per capita income countries such as Saudi Arabia and Oman ($5500-7500). It rises for still higher income countries such as Kuwait ($14000) only to dip in the case of UAE with a much higher per capita income ($22000). Tunisia and Morocco have decidedly higher female participation rates despite their relatively lower per capita income relative to Mashreq and Gulf countries.



II.4 Participation and Fertility

The single most remarkable demographic aspect of the Arab region is the nearly universal high fertility level-the average level of childbearing is 6 children per woman. Does fertility hinder female labor participation? At the macro-level evidence suggests an adverse impact of Arab high fertility on women's labor participation. Chart (2) utilizes World Bank data (1995) to plot variations in total fertility rates against variations in female labor supply in twelve Arab countries. While the fitted line indicates a tendency for labor supply to rise as woman's fertility declines, the graph depicts a departure from the trend in two of the twelve country data points. The Sudan for instance has a high fertility rate 5.7 in 1993 and a female labor participation rate of 23 percent which is higher than region's average rate. Syria's fertility of 5.8 is also high while women's labor participation rate (close to 20 percent) is higher than the region's average of about 17 percent.

Fertility and women's labor supply trends, Arab countries, 1993



The confounding fertility-labor supply causal link at the macro level is partly an identification problem and partly a data problem. Variations in the structure of production; e.g., the importance of primary economic activities, may induce inter-country variations with respect to women's labor participation. Joint-determination may also mar the trend analysis: Human capital factors; e.g. education, that cause fertility decline may also enhance female participation in the formal sector. Fertility variations may result from variations in the regional disparities in the living conditions (e.g. rural poverty and educational disparities) or inter-class variations in the distribution of resources within the same country. In Algeria for instance, women still gave birth to more than six children in the southern part of the country but less than four in the north. Lebanon despite its small size harbors strong regional contrasts from Beirut (2.3 children per woman) to the north (4.3 children per woman). In Egypt the average family numbers only 3.6 children in Port Said but 8.2 in Fayoum (Fargues, 1994).

Declining fertility may also result from "development" and institutional forces. For example, development and improvements in overall health standards reduce child mortality and given the joint determination between fertility and child mortality (Schultz, 1993) the demand for high fertility may weaken. Fertility variations may result from variations in inter-country commitment to family programs that target fertility reduction. The concerted efforts of the Tunisian government in this regard is an example. The legal code in that country grants freedom to use contraceptives, available at almost no cost. As a result of the public promotion of contraception and a conducive environment, fertility rates have been halved in the past 20 years (UNDP, 1995). On the other hand, the governments in Bahrain and Kuwait have sought to expand native women's labor supply in order to mitigate dependence on foreign labor. It must be noted however, that family planning programs may beget unintentional outcomes that could hamper female labor participation. Work conducted by Zuraik and associates (1994) suggests that family planning programs that focus strictly on fertility reduction without proper consideration to the potential impact on mothers and children may inadvertently inflict health damage on mothers and thereby reduce women's capacity to participate effectively in the labor market.

II.5 A Two-Step Model of Fertility and Labor Supply

Participation is influenced by supply and demand forces. Earlier empirical work has attempted to identify variables which might have an effect on the women's supply or the demand side without attempting to identify separately either the supply or the demand curve. For example, Azzam et al. (1985) use data from 18 Arab countries to estimate a country's female labor force participation rate as a function of the crude birth rate, the proportion of migrants in the labor force, the female illiteracy rate and a dummy variable which reflects the degree of restriction on women's activities. As Papps notes "Such work underlines the interrelationship between fertility and labor force decisions and indicates the danger of trying to identify the determinants of such decisions within a single-equation framework. Econometric analysis of such complex decisions should recognize that the observed values of these variables are simply (at best) the equilibrium outcomes of the interaction of supply and demand factors" (Papps, 1992:603).

If women's labor supply is inter-dependent with fertility, then analysis that seeks to identify the direction and relative importance of factors affecting participation must address fertility behavior as well. In an attempt to provide a preliminary assessment of the potential link between these variables and their correlates, we utilize below the Murphy and Topel methodology (1985). The methodology consists of estimating two equations. In the first, a Poisson maximum likelihood fertility count equation is estimated. The predicted values of the equation are then employed in the set of regressors in the second equation which is a labor supply equation. The estimation is performed on data covering 108 countries of which 16 are Arab. Equations of the two-step model are:

$$fr = f\,(educ, rgdp, ar) \qquad \textbf{(II.1)}$$
$$ls = f\,(rgdp, educ, agrlf, indlf, ar, fr^h) \qquad \textbf{(II.2)};$$

where **fr** and $\mathbf{fr}^h$ are the actual and predicted total fertility rates, ***ls*** is female labor supply, ***educ*** is female primary enrollment rates, ***agrlf*** and ***indlf*** are the proportions of labor in agriculture and industry respectively, and ***rgdp*** is per capita gross domestic product. The dummy variable ***ar*** takes a value of one if the country is an Arab country and zero otherwise. The two-step strategy forms the estimated residuals from equation (1) based on the estimated vector of parameters, which are then used to replace the unobserved true value of fertility, in estimating the parameters of the second step, equation (2). The source of the data is the Human Development Report for the years 1990-1994. Female enrollment variable is lagged a few years in order to fully capture the potential delay in the impact of school enrollment.

The results of the fertility equation, shown in table (4), suggest the following. First, a rise in the conventional indicator of development -- per capita income-- leads to a reduction in fertility; the higher the per capita income the lower is the fertility rate ceteris paribus. Female education has the expected negative effect on fertility. The dummy variable capturing Arab countries has a negative sign in the participation equation and a positive sign in the fertility equation; implying that Arab fertility and women's labor supply lag behind international levels.

Estimation results reveal that women's labor supply generally rises with per capita income as inferred from the sign and strong statistical significance of the per capita income coefficient in the participation equation. Female enrollment variable is associated with a rise in women's labor supply. The results also suggest that where agriculture absorbs a sizable proportion of employment, women's participation tends to be more pronounced. This finding is in accord with the empirical evidence documented in the literature (Tumham, 1993). High fertility impedes women's participation as shown by the statistically significant sign of the (predicted) fertility coefficient. Therefore, this simple framework points to a negative impact of high fertility on women's participation and provides a strong support for the hypothesis that fertility and women's labor supply lag in the Arab countries relative to international levels. While these findings are tentative, they underscore the importance of data availability. To better identify the causal relationship between fertility and female labor supply in the Arab countries, quality data properly disaggregated along several dimensions including the geographic and inter-class must become available. Such data would provide critically needed information about the link between women's supply and fertility particularly that fertility rates have begun to decline in all countries, decreasing 25 percent or more in Algeria, Egypt, Jordan, Lebanon, Morocco and the Gulf countries, corresponding to increases in contraceptive use, table (3).

III. MICRO-LEVEL ANALYSIS

The remainder of this paper utilizes micro-level data in order to examine the determinants of women's labor supply. The model is a two-step (T-S) econometric model that consists of two equations. The first, is a Poisson fertility count equation whose parameters are estimated using the maximum likelihood technique. Predicted values of this equation are then employed as an explanatory variable in the set of regressors of the second equation which is a probit labor supply equation. While focusing on the fertility-to-labor link, the analysis also examines other demographic, economic and sociological determinants. The fertility equation incorporates a set of fertility determinants including son preference, the impact of child death and woman's age at marriage. Empirical evidence suggests that son preference is positively associated with the actual fertility rate; and that the younger the age at marriage the higher is the fertility rate. Within the family framework, the higher the infant mortality rate the larger is the fertility because of "hoarding" and "replacement" effects (Schultz, 1993). Economic theory predicts that the demand for children is also influenced by the opportunity cost of having them and by resources available to the household. Estimates reported below include variables which capture women's wage and household total resources as regressors in the fertility equation.

Let Yi, denote the number of fertility occurrences for the ith of N women, in a given interval of time, Y_t=0,1,2.... Let y(t, t+dt) denote the number of events observed in the interval (t, t+dt). If

$$Pr[y(t, t+dt)=0]=1-\lambda dt+O(dt) \qquad (III.1)$$

and

$$Pr[y(t, t+dt)=1]=\lambda dt+O(dt) \qquad (III.2)$$

so that

$$Pr[y(t, t+dt)>2]=O(dt), \text{ as } dt\rightarrow 0 \qquad (III.3)$$

then the number of events in an interval of a given length is a Poisson distribution with the probability density

$$Pr(Y_i=y_i)= e^{-\lambda}\lambda_i^{y_i}/y_i!, \quad y_{i=0,1,2,...}, \quad i=1,2,...,N \qquad (III.4)$$

where y_i is the realized value of the random variable. To incorporate exogenous variables including a constant, the parameter λ_i is specified to be

$$\lambda_i = \exp(X_i\ \beta)$$

Predicted values derived from the Poisson maximum likelihood fertility equation are used in the labor equation. In addition to predicted fertility values, the labor supply equation includes female age groups, marital status, education levels, and a variable capturing the presence of children in school-going age. The method of estimation is the maximum liklihood probit model. More specifically, the labor participation equation takes the form (Greene, 1990):

$$V_j = C_j + Zf_j + Y_{pj}\gamma_j + u_j\,; \quad j = p, n \qquad (III.5)$$

Where **Z** is a vector of explanatory variables; $\mathbf{Y_{pj}}$ is the predicted values of fertiltiy fitted from the poisson random count equation; $\mathbf{u_j}$ is an error term assumed to be distributed normally. The variable $\mathbf{V_j}$ (j = **p** , **n**) connotes labor participation and non-participation respectively. The probability model is a regression:

$$E[Y] = 0\,[\,1 - F[\beta'X)] + 1\,[F(\beta'X)] = F(\beta'X) \qquad (III.6)$$

Since the model is nonlinear, its parameters are not necessarily the marginal effects encountered in linear models. The model's density function is:

$$dE(Y)/dX = f(\beta'X)\beta \qquad (III.7)$$

The next section discusses the micro data for four countries followed a brief discussion of the labor profile in each country. The four countries are Kuwait, Jordan, Oman and Palestine (West Bank and Gaza).

III.1 Data Description

This part provides a summary of work in progress on labor participation as gleaned from micro-level data sets. The discussion will also highlight data sources for the West Bank and Gaza, Oman, Jordan, and Kuwait. The analysis on Palestinian women draws on the data collected by the Norwegian Institute. For Applied Social Science (FAFO), which carried out a survey of the living conditions in Gaza, the West Bank and Arab Jerusalem in the summer of 1992. The study which was funded by the Norwegian Foreign Ministry collected information from 2,500 heads of households and randomly selected individual household member respondents above 15 years of age. The study was the first of its kind and probed in a comprehensive fashion, important facets of economic, social, health, psychological and human resource conditions of Palestinians under occupation. The Territories have not had censuses since their occupation in 1967, so FAFO drew its stratified sample based on populations estimates conducted by the Israeli Central Statistical Office and by Benvenisti. Researchers drawing and implementing the survey were aware of the tedious task of collecting information under severe (in)security problems and the likelihood of potential respondent bias. Their sample attempted to validate to the extent possible the accuracy of the results by including probing questions in order to cross examine response of consistency purposes.

For Kuwait and Oman, the analysis draws on the rich population censuses of Kuwait and Oman. The empirical work employs a sample representing 25 percent of Kuwait's 1985 census. The census did not include wage information but covered in detail all demographic and sociological and activity aspects of the population. The data for Oman is essentially a randomly sample drawn from the census itself and represent nearly 6 percent of Omanis in 1993.

For Jordan our source of micro-data is the Health, Nutrition, Manpower, and Poverty Survey of 1987. The survey utilized a stratified multi-purpose sampling procedure to select a representative sample of urban and rural households drawn from the 1979 population census sampling frame. The survey was conducted by the Jordanian Department of Statistics in collaboration with the Department of Population Studies at North Carolina State University, USA. An important feature of this survey is the multiplicity of its purpose and the richness of the collected data. The data comprised six components each designed to provide information on specific attributes and issues such as the characteristics of existing housing stock, the demographic, social and economic characteristics of the rural and urban population, the health and nutrition status of the population as well as the poverty level. Specialized agencies: the Ministry of Health, the Departments of Medicine and Agriculture of the University of Jordan in addition to the Department of Statistics contributed to designing the questionnaire. The field work was conducted during August and September of 1987 utilizing the housing block as a unique geographic sampling identifier. Collected data covered sociological attributes of the individuals including age, education, years of job-tenure, employment status, occupational affiliation, household size, monthly salary and household income by source. In the case of women, the collected data documented, in addition to marital status, the duration of marriage for married females; number of male and female survivals, marriage duration, number of marriages, frequency of pregnancies and nursing patterns.

III.2 Country Labor Profile

The countries studied here while sharing some common characteristics, do have marked differences. The common elements include the low levels of female participation and occupation concentration. Differences include the institutional and administrative structure, most notably in the case of the West Bank and Gaza and the pattern of labor demand and unemployment rates. An analysis of these commonalties and differences is beyond the scope of this paper, but our discussion here will provide a birds-eye view of salient labor structures of these countries.

The employment structure in Oman has undergone a rapid transformation. In 1980, about 62 percent of active Omani nationals worked in the rural and traditional sectors. By 1985, nearly 75 percent of the total national work force (including almost all active women) were employed in the public sector. Accordingly employment of nationals in the agricultural sector shrunk to 15 percent (Looney, 1994). As of 1993 Omanis represented about 25 percent of the total workers. The majority of foreign labor are Asians with Pakistani and Indian workers comprising more than 85 percent of all foreign workers. Omanis cluster in the public sector where the terms of employment including wages, benefits, and tenure are all better than private sector terms. It is in this sector that nearly 8100 Omani women find employment predominantly as white-collar teachers, social workers, clerks and office employees. They comprise about 16 percent of the total number of Omani civil servants. Over time, there has been a perceptible rise of Omani women's labor participants. In 1973 it is estimated that 6.7 percent of females were in the labor market, by 1993, the ratio stood at 9.1 percent (World Tables,1995). As in the case of other Arab women workers Omanis employed in the formal sector are relatively well trained with 63 percent having completed secondary schooling or better. In fact women who hold university degrees make up 15 percent of female civil service workers-the corresponding ratio for men is 7.3 percent (Development Council, 1993).

In the case of the West Bank and Gaza, available data indicate that Palestinian male labor participation rates hover around 70 percent of the population 15 years and older. Historically and up to the early 1990s, the male participation has been sensitive to the dynamics of labor emigration to the Gulf for highly educated labor and changes in Israel's demand for low-skill Palestinian labor (Shaban, 1993). Other contributing forces include the vacillation in the Palestinian access to the Israeli labor market as a result of inftifadah, border closures and changes in the Israeli command and control regulation of Palestinian labor movements. The clustering of Palestinians in construction makes their supply mostly volatile because of its sensitivity to Israeli policies affecting the construction sector, notably interest and income (including minimum-wage) policies.

Palestinian labor participation is low-less than 5 percent in Gaza and around 10 percent in the West Bank. However, there has been a slow but perceptible improvement in the female labor participation. More specifically, an increasing number of Palestinian women have been taking-up productive employment partly as a result of their increased education. For instance, during the period 1950-1989, the ratio of male to female students enrolled in UNRWA has recorded a dramatic jump in favor of females from (M/F ratio 0f 74:26) to a ratio of 51:49 (Sosebee, 1990:84). Participation in labor market has also been induced by a replacement process whereby women have been increasingly "filling-in or replacing" a large number of absent men. A great number of women go to work in Israel as migrant agricultural workers and some Palestinian women are also employed by Israeli subcontracting enterprises set up in the occupied territory. These subcontracting enterprises specialize in finishing goods such as garments imported from Israel.

The Jordanian profile reveals a rapid population increase, 3.5%, and a high population momentum. The persistence of high fertility levels combined with successful health measures and rising living standards that significantly reduced mortality and morbidity levels characterize a young Jordanian population that has predictable high rates of natural increase, high population momentum and fast growing labor force(Sirageldin et.al.,1986). In 1985 nearly 51% of Jordan's population were under 15 years of age and the sex ratio was 109.7% (Al-Samadi,1987). While women's labor participation in Jordan has been increasing over time, its pace is less rapid than that of Kuwaiti women; i.e. from about 6.4 in the early 1970s to 10.1 percent in 1990 and is estimated at 14 percent in 1991 (Amerah; World Bank Data 1995).

An important transformation that has occurred in the labor market of Kuwait over the past thirty years concerns the evolution of female labor force. That is, women charted employment changes by working less in home production activities, for which neither money nor barter is exchanged, and more in activities that are generally compensated outside the home. The transformation process has been very rapid with the overall labor participation of women rising from only 2 percent in 1965 to nearly 25 percent in 1995. The government has called for efforts to reduce excessive dependency on foreign labor. As of 1993 nearly 80 percent of the country's labor force is composed of foreign workers. Kuwaiti women have been considered as a necessary component of a strategy to ameliorate foreign labor dependence. An increase in the extent and locus of female employment would not eliminate this problem, of course. It is the result of fundamental disequilibria in the labor market that have developed over the past thirty years.

IV. EMPIRICAL FINDINGS

Only three of the four country data sets allow the utilization of the two-step econometric estimation of the fertility-labor supply structural model. For Oman, Jordan and Palestine the results are derived from the Murphy and Topel methodology whereas estimates for Kuwaiti women's labor supply are based on a simple probit model. The Poisson fertility count equation for Oman, summarized in table (5), reveals the following. First, fertility is a quadratic function of age, both the age and age squared variables are strongly significant. Fertility peaks at the age of 50.2 years, (∂ **fr**/ ∂ age is maximized at 50.2 years). Women's age at marriage is negatively correlated with fertility. Since women's age at marriage is increasing over time, this finding implies that fertility will decline in this country. Women's level of education exerts a powerful negative impact on her fertility meaning that the big push of educational investments that Omani women have been receiving result in a discernible decline in their fertility level. Estimates of the Poisson function reveal that the expected fertility of Omani women in the age group 25-45 varies discernibly according to education. For women with no education, the expected fertility is 7.5; for women with six years of education the expected fertility declines to 5.6 and reaches a minimum of 3.3 for women who have completed university education. One can think of education as affecting fertility through increase the age at marriage, increasing the opportunity cost of having children and improving the health of both mother and infant. These outcomes reduce the risks of child mortality. Reduced child mortality acts to weaken the demand for children for replacement purposes. This latter effect is inferred from the positive impact that the variables "child mortality" has on fertility. The variable capturing son preference indicates that families that have a higher female-to-male children sex ratio tend to have higher fertility, ceteris paribus. Finally, the Poisson model is a satisfactory fit of Oman's fertility count data as induced by the log-likelihood and goodness-of-fit criteria.

Table (5) contains the marginal effects for the probit estimates in the case of Omani women along with the variable means. The dependent variable takes a value of one if the woman is working and zero otherwise. The implied marginal effects of each explanatory variable on the probability of becoming a labor market participant evaluated at the mean values of all the variables are given together with the standard errors of the marginal effects. The overall fit of the equation is quite good as gleaned by the Pseudo R^2 and the log likelihood. The coefficients of the age groups are positive and significant peaking at the age group 25-34 years where the marginal effect of the function(dF/dX) is 57 percent relative to the base age of 15-19. The coefficients on all educational levels are all positive and significant and increase in size as one moves to higher levels of education. The peak is reached around 14-16 years of education. Married women have a 33 percent lower probability of labor participation than single women. The coefficient of the variable connoting predicted fertility is strongly negative implying that the higher the fertility level, the lower is the expected probability of labor participation. Similarly, women who care for nursing infants under two years of age have lower probability of engagement in market activities. As expected, poor health reduces the likelihood of participation by nearly 15 percent relative to women in good health, ceteris paribus.

Our findings for Jordan are summarized in table (6). For the fertility equation they give a pattern similar to that derived from Oman's estimates. First, fertility increases with age up to a certain age beyond which the impact of age on fertility becomes negative. The function peaks at the age of 56.7 years. Age at marriage has a negative effect on women's fertility; that is an increase in marriage age leads to a reduction in women's fertility level, ceteris paribus. Increased levels of education produce a significant reduction in fertility levels. As in the case of Oman, infant mortality is associated with a rise in fertility; women who experience child loss are likely to demand more children for replacement purposes, ceteris paribus. As economic theory predicts, children compete for women's time and the opportunity cost rises as more children are born to a working woman. The coefficient of the female wage is negative implying that the higher the wage earnings the lower the fertility level of women. Similarly, women who belong to well-off families tend to demand less children perhaps because the demand for higher-quality children and its attendant costs kicks-in. This is inferred from the negative and significant sign for the coefficient on the family resources.

Labor supply estimates for Jordan are also shown in table (6). They reveal the following. First, relative to the base age of 15-19, participation of Jordanian women increases with age. The largest marginal impact occurs at the age group 35-44 which is higher than the age peak for Oman. An increase from one educational level to the next is associated with a rise in the probability of women's participation. The greatest marginal impact of education occurs at the university level (16^+ years of education). Married women have decidedly lower likelihood of participation than single, widowed or divorced women. The impact of fertility on women's participation is negative; higher fertility lowers the prospects of women's labor market participation. Finally, women who belong to well-off families tend to have a lower likelihood of participation than other women, although the coefficient of this variable lacks statistical significance.

Empirical results for the Palestinian data are given in table (7). Fertility estimates show a pattern similar to that for Oman and Jordan. Age and its squared are significant determinants of fertility, the peak occurs at the age of 53.4 years. As in the findings of Oman and Jordan, woman's age at marriage produces a negative and statistically significant influence on fertility. Women's education is negatively associated with fertility but the relationship lacks significance. Cultural norms that favor male offspring --son preference--have a powerful influence on fertility which we glean from the significant and positive coefficient of the son preference variable. As in the cases of Jordan and Oman, infant mortality exerts a positive impact on fertility for replacement purposes. The model is capable of explaining nearly 23 percent of the fertility count variations, which together with the log likelihood value indicate an acceptable fit of the model to the Palestinian data.

We turn next to the findings of the labor supply regression which in the case of Palestinian women suggest that women's age influences her choice between domestic and market work. Interestingly, women's participation peaks in the age brackets 45-54 and 55-64. This suggests that the harsh political and economic conditions facing Palestinian households force many women to become "household heads" because the male head is either jailed, exiled, physically disabled, working abroad or deceased. In FAFO's Palestinian sample over 20 percent of households are headed by women. Data limitations prevent testing the relative impact of each of the "male absenteeism reasons" on women's participation. Another somewhat surprising result is that while education is generally positively associated with market participation, the association is not smooth. Rather, there appears to be a U-shaped relationship between education and women's participation: Relative to women who do not have any education, participation rises for women with primary level of education, tapers-off for women with intermediate and high school levels of education but rises again at a steep rate for junior college graduates and university-educated women. It is plausible that many women work as sub-contractors for Israeli clothing industry inside the West Bank and Gaza strip where hand skills together with some basic education (i.e. ability to read and write) are the main requisites for employment. Many of them may also work at home, an arrangement that provides protection and security (Siniora, 1989). At higher levels of education participation is enhanced by the rising opportunity cost of home production activities. Marriage increases woman's home responsibilities and leads to withdrawal of labor market participation. Similarly, the coefficient of the predicted values of the fertility variable is negative and significant; indicating a negative influence of fertility on participation. The presence of children in school-going age lowers women's participation.

As noted above, data limitations do not allow the application of the two-step fertility-to-labor supply modeling in the case of Kuwait. Instead, estimates for that country are derived from a single equation maximum likelihood probit model. Kuwait's data are derived from the 25 percent sample of the 1985 population census and cover over 55800 women. Therefore, we should be prudent in comparing Kuwait's estimates with those for the three other countries because of differences in estimation method, data size and coverage. Table (8) displays results of the probit participation model. They reveal that the overall fit is quite high, the Pseudo R^2 is 0.55, and the log likelihood estimate is high too. The marginal impact of age on participation is positive; the peak impact occurs at the age bracket 35-44. As in the case of Oman and Jordan, education is a major pathway to participation. The greatest impact is obtained for women who complete 14 years of schooling; equivalent to a two-year college or diploma. Women who achieved university education have profoundly much higher participation prospects than women with only high school education or below. Marriage increases the demand for women's time for domestic activities and therefore is negatively associated with Kuwaiti women's labor market participation.

V. CONCLUSIONS AND POLICY IMPLICATIONS

The salient findings of the research and empirical work reported here can be summarized as follows. The two-step modeling framework between fertility and women's labor supply provides important insights about the fertility-participation link. The Poisson maximum likelihood estimation demonstrates that age at marriage, women's education, infant mortality and preference for male offspring are important determinants of fertility. Reduced infant mortality rate is associated with fertility reduction. A rise in women's wage increases the opportunity cost of having children and therefore leads to a decrease in fertility. As families become well-off, their demand for children is reduced presumably because demand for "quality kids" kicks in and the cost of providing the quality dimension rises.

Estimates of the maximum likelihood labor supply function reveal the following. First, there is a significant degree of dependence between fertility and labor participation; that is, fertility produces a negative influence on women's labor participation. Secondly, age is positively correlated with labor force participation, up to a certain point, beyond which its effect becomes negative as revealed by the relative magnitude and signs of the coefficients of age group variables. Third, in all countries, the findings demonstrate a strong association between education and participation. Education is an important pathway to effective engagement of Arab females in market activities. While education pays-off in each of the four countries its impact appears stronger in Oman and particularly Kuwait. A plausible explanation is in terms of the role of labor demand. For a long time Kuwait has attempted to replace non-Kuwaitis with Kuwaitis by providing lucrative employment prospects for its men and women. The private returns for female education are quite generous (Al-Qudsi and Fangary, 1988). Two factors may mitigate the extent of the rise in demand for female labor in Jordan, West Bank and Gaza and to lesser extent in Oman. First, unemployment rates are relatively higher; even in Oman the 1993 census put the unemployment rate at 13 percent. In contrast, Kuwait's unemployment rate is below 4 percent. Second, labor market interventions aimed at shifting the demand for women's labor are less frequent and ambitious because resources available to public sector are less abundant; accordingly one would expect labor demand to shift less intensely to accommodate the incremental supply of graduates.

Another positive yield of education is in terms of stability of women's engagement. Not only does education appear to be a pathway to labor market participation but also a means of "retaining" them active in the market. Across successive age cohorts, the more educated remain actively involved in comparison with less educated women. Thus Omani women who completed at least secondary education have an expected probability of labor participation that remain firm at successive age groups: university-women in the age-group 20-24 and 35-44 have expected participation probability of 0.88 and 0.93 respectively. By contrast, the expected participation probabilities for women in the age brackets but with primary education only are .075 and .048 respectively.

Women's poor health adversely affects labor participation. This is evident from the negative and strongly significant coefficient of the variable connoting women's health in the regressions for Oman, Jordan and the West Bank and Gaza. A fifth noteworthy finding is that household structure variables,viz.,marriage, family size and age structure of children, are generally significant forces of women's labor participation. They also reveal that traditional division of labor between men and women within the family produces weaker labor force attachment for women. A final provisional finding is that the larger the family resources the lower is the expected probability of female employment in market activity.

Taking a future look and given the existing Arab population and education momentum our empirical work suggests a policy dilemma. From the policy perspective, a large number of women will become prospective job seekers in the Arab labor markets in the few years to come. The waves of job-seekers will increase with the rising educational attainment of women concurrent with improvements in health standards and reduced fertility rates. The momentum will receive a strong push from at least two forces. First, the high population growth which begets rapid female (and male) labor supply. In the past two decades the rate of growth of female labor supply has been higher than that of men and the trend will most likely accelerate in the same direction. Secondly, increased openness of Arab economies and societies which the telecommunication and information revolutions is inducing. To what extent would Arab economies be able to absorb the prospective female participants is far from clear. The Gulf crisis greatly decelerated migratory movements and reduced the scale of inter-Arab labor demand. Domestically, unemployment of men and women took a sharp rising trend. Uncertainty about the ability of markets to accommodate prospective female participants is compounded by the shocks which structural adjustment programs have thus far produced. It remains to be seen whether the drive towards privatization and export-led growth would provide sufficient employment opportunities to accommodate new comers and displaced public sector women (and men) workers.

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Table (1) Women's Sectoral Distribution in Arab Countries

Sector	Algeria (1987)	Bahrain (1991)	Egypt (1986)	Iraq (1987)	Jordan (1989)	Kuwait (1988)	Sudan (1983)	Syria (1989)	Tunisia (1989)
Primary									
Total	13.6	0.8	35.7	13.5	--	1.3	63.5	22.0	21.6
Male	13.4	0.8	34.9	10.7	--	1.2	41.6	16.1	17.9
Female	0.2	--	0.8	1.8	--	0.1	21.9	5.9	3.7
Second.									
Total	24.5	54.5	18.8	17.3	22.6	25.1	7.3	27.8	28.2
Male	23.4	53.9	17.8	16.0	20.6	24.7	6.1	25.8	21.0
Female	1.1	1.6	1.0	1.3	2.0	0.3	1.1	2.0	7.3
Tertiary									
Total	40.6	44.7	34.7	65.4	77.7	72.1	19.9	46.4	34.0
Male	33.8	38.4	28.5	57.9	56.0	48.8	17.1	40.0	28.6
Female	6.8	6.3	6.2	7.5	21.7	23.3	2.8	6.4	5.4
Overall									
Total	100	100	100	100	100	100	100	100	100
Male	90.8	93.1	89.1	88.4	76.6	75.7	70.9	84.6	79.1
Female	9.2	7.9	10.9	11.6	33.4	24.3	29.1	15.4	20.9

Source: ILO 1991, 1993; ESCWA, 1993.

Table (2) Females as a Percentage of Males Gaps

Country	Literacy		Yrs.of School-ing	Primary enrollment		Secondary enroll.	Tertiary enrol.	Female Lab. Gr.
	1970	1992	1992	1960	1990	1990	1990-92	1990-95
Kuwait	65	87	78	78	..	129	32	2.2
Qatar	..	..	93	..	96	..	8	..
Bahrain	..	84	68	..	100	122	22	..
UAE	29	..	102	..	100	..	6	3.0
Saudi Arabia	13	66	25	..	82	82	8	..
Syrian A.R.	33	..	60	44	90	71	22	4.7
Libyan A.J.	22	67	24	26	..	87	10	4.4
Tunisia	39	76	40	49	92	68	27	3.9
Oman	..	..	21	..	95	81	9	5.4
Jordan	45	79	67	63	102	118	11	8.1
Iraq	36	70	68	38	88	64	6	4.9
Lebanon	73	83	66	94	..	..	37	3.5
Algeria	28	66	18	67	89	..	..	6.2
Egypt	40	54	41	65	..	52	41	3.5
Morocco	29	62	37	40	68	58	35	3.8
Yemen	15	51	15	..	..	40	15	
Sudan	21	28	45	40	..	70	41	4.3

Source: Human Development Report, 1994. UNDP. ILO/ALO(1993). New York Oxford.

Table (3) Demographic Profile of Arab Countries

Country	Total Fertility Rate (1992)	Change in Fertility Rates (1992/1960) * 100
Kuwait	3.8	52
Qatar	4.5	65
Bahrain	3.8	54
UAE	4.6	66
Saudi Arabia	6.5	90
Turkey	3.6	56
Syrian A.R.	6.3	87
Libyan A.J.	6.5	92
Tunisia	3.6	50
Oman	6.8	96
Jordan	5.8	76
Iraq	5.8	81
Lebanon	3.2	51
Algeria	5.0	69
Egypt	4.2	60
Morocco	4.5	63
Yemen	7.3	97
Sudan	6.2	92

Source: Human Development Report, 1994.

Table (4) Cross-Country Regression Results of Women's Participation and Fertility (Poisson M.L.Estimates and Maximum Likelihood Probit Estimates; The Two-Step Model)

Equation/Var.	Coefficient	Standard error	Var. mean
1.Fertilty count Eq.			
Per-capita GDP ($)	-.003834**	.001678	4288
Primary Education	-.0000776*	.0000148	83.3
Arab Country=1	.3165171*	.1198715	.1231
Intercept	1.998554*	.1254293	
2.Labor Part Eq.			
Predicted Fertility	11.05877**	4.874334	4.32
Per-capita GDP	.0046023*	.0011262	4288
Primary Education	.34319*	.1499542	83.3
Share of Agr. lab.	.555013*	.1357543	42.65
Share of Ind. lab.	.6107687**	.253705	16.89
Arab Country=1	-48.30307*	9.253309	.1231
Intercept	-72.31556**	33.93233	
Log-likelihood eq. (1)	-193.337		
Pseudo R^2 eq. (1)	.1595		
Adj. R^2 eq. (2)	.3919		
Root MSE eq. (2)	19.0553		
No of observations.	108		

*Coefficient significant at 1%
**Coefficient significant at 5%

Table (5) Maximum Likelihood Poisson Fertility Count and Maximum Likelihood Probit Model: Oman, 1993.

Equation/Variable	Coefficient	Standard error	Var. Mean
Poisson Fertility Eq. 1			
Age	.0661033*	.0009942	32.24
Age squared	-.000659*	.0000103	1313.51
Age at Marriage	-.003603*	.0003293	17.98
Education (Yr.)	-.039295*	.0011914	3.13
Infant Mortality	.0435063*	.0007104	1.4547
Son Preference	.0375852*	.0021291	1.1061
Intercept	.3403418*	.0228968	
Log Likelihood	-60222.22		
No. of Observations	25481		
M.L. Probit Equation 2↓	Marginal Effect	Standard error[a]	
Age Gr. 20-34[b]	.0366564*	.0039984	.3771
35-44	.0574593*	.0056595	.1954
45-54	.0461598*	.0058011	.1495
55-64	.0276433*	.0056409	.1083
Education: RAW[c]	.029119*	.0035321	.1755
Primary	.0539137*	.0044359	.1241
Intermediate	.0959338*	.0045628	.0589
Secondary	.1887804*	.0071563	.0178
University	.1696045*	.0090061	.0087
Marital St.: Married=1	-.0326212*	.0024743	.5593
Predicted Fertility from eq.1[d]	-.0046224*	.0009879	6.517
Poor health=1	-.0150464*	.0078679	.0278
Infant age<1	-.0086197*	.0027332	.1738
Infant age<2	-.0095447*	.0027431	.1795
Intercept	-1.700211*	.1028506	
Log likelihood	-2977.9612		
No. of observations	23776		

↓Dependent variable is working/not working.

[a] Standard errors are corrected utilizing Murphy and Topel (1985).

[b] Base age group =15-19 years old.

[c] Base group no education

[d] Derived from the Poisson maximum likelihood regression.

*Coefficients significant at 1%

Table (6) Maximum Likelihood Poisson Fertility Count and Maximum Likelihood Probit Model: Jordan,1987

Equation/Variable	Coefficient	Standard Error	Var. Mean
Poisson Fertility Eq. 1			
Age	.0720829*	.0026584	40.625
Age Squared	-.000669*	.0000264	1875.9
Age at Marriage	-.060481*	.0011662	20.28
Education (Yr.)	-.023995*	.0019377	3.59
Infant Mortality	.0712005*	.0034167	.7681
Son Preference	.0415354*	.0049737	1.124
Wage	-.001131*	.0003525	91.25
Household Resources	-.000238**	.0001158	151
Intercept	-1.59914*	.0696365	
Log Likelihood	-9049.053		
No. Of Observations	3819		
M.L.Probit Equation 2	Marginal Effect	Standard Error[a]	
Age Gr. 20-24[b]	.064269*	.0081134	.10771
24-29	.207216*	.0142936	.24884
30-34	.492573*	.0312128	.23455
35-44	.820941*	.050408	.18169
45-54	.680458*	.061438	.12831
55-64	.215325*	.042717	.06279
Education: RAW[c]	.014418**	.006755	.1498
Primary	.029845*	.008227	.00111
Intermediate	.062489*	.009052	.10724
Voc Diploma	.265697*	.055669	.06512
Secondary	.193510*	.013728	.04553
2-Yr. College	.517473*	.022997	.27521
University	.492469*	.032058	.55854
Marital St.: Single[d]	.008452	.007746	.03458
Married	-.03766*	.007126	7.6782
Divorced	.049181**	.021656	151
Predicted Fertility from eq.1[e]	-.0141593*	.001242	.02319
Household income	-.0000122	.000028	91.25
Health	-.0112775	.008342	.02319
Intercept	-2.420356	.172774	
Log liklihood	-1309.1036		
No. of observations	8034		

[a] Standard errors are corrected utilizing Murphy and Topel (1985).
[b] Base age group= 15-19 years. [c] Base group= no education
[d] Base=widowed
[e] Derived from the Poisson maximum likelihood regression.
*Coefficients significant at 1%
**Coefficients significant at 5%

Table (7)) Maximum Likelihood Poisson Fertility Count and Maximum Likelihood Probit Model , West Bank & Gaza,1992.

Equation/Variable	Coefficient	Standard error	Var. Mean
Poisson Fertility Equation 1			
Age	.1105148*	.0062997	35
Age Squared	-.0010354*	.0000681	1483.45
Age at Marriage	-.0406158*	.0035193	19
Education (Yr.)	-.0009628	.0027280	7
Son preference	.0513706*	.0093830	0.9870
Infant mortality	.0965155*	.0090901	.71727
Intercept	-.0227402	.1449979	
Log Likelihood	-1856.723		
No of Observation	817		
M.L. Probit Equation 2	Marginal Effect	Standard Error[a]	
Age Gr. 20-24[b]	.4776369*	.2892922	.1404
25-29	.5184311*	.2055472	.2599
30-34	.5659348*	.1821332	.1872
35-44	.6375268*	.1848125	.0686
45-54	.5711608*	.2892581	.1259
55-64	.6645767*	.1956868	.0508
Education: RAW[c]	.0532633*	.1500978	.2112
Primary	.0487382*	.1736073	.2494
Intermediate	-.052433	.3193983	.0869
Secondary	-.005295	.2382473	.1303
2-Yr. College	.2707035*	.2271864	.0479
University	.0411555*	.3956676	.0296
Marital St.: Married=1[d]	-.0108445	.1150277	.6892
Predicted Fertility from eq.1	-.005902**	.02275	7.084
Child age<5	-.003315	.0337529	1.284
Intercept	-6.309026*	.2719669	1.0
Log likelihood	-410.1741		
No. of observations	1150		

[a] Standard errors are corrected utilizing Murphy and Topel (1985).
[B] Base age group=15-19.
[c] Base= single
[d] Derived from the Poisson maximum likelihood fertility regression
*Coefficients significant at 5% or less
** Coefficient significant at 10% or less.

Table(8) Maximum Likelihood Probit Estimates for Women's Labor Participation, Kuwait, 1985

Variable	Marginal Effect	Standard Error	Var. Mean
Age Gr. 20-24 [a]	.779283*	.0181011	.21035
25-29	.977090*	.0158811	.1754
30-34	.982544*	.0139411	.2654
35-44	.994862*	.0142564	.1625
45-54	.996266*	.0155854	.0952
55-64	.930857*	.1012018	.0604
Education: RAW[b]	.009259*	.0008125	.0765
Primary	.026889*	.0010934	.1012
Intermediate	.109984*	.0022585	.2046
Secondary	.190093*	.0038198	.0967
2-Yr. college	.713451*	.0103277	.0435
University	.674123*	.0098757	.0422
Marital St.: Married[c]	-.00239*	.0002692	.6009
Widowed/Div.	-.00415*	.0003268	.1129
Intercept	-8.3843*	.110035	
Log likelihood	-8822.9793		
Pseudo R^2	0.5496		
Number of observations	55805		

[a] Base is persons who are 15-19 years old

[b] Base is persons with no education

[c] Base is single persons.

*Coefficients significant at 1%

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