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Economic Development and Female Labor Force Participation in the Middle East and North Africa: A Test of the U-Shape Hypothesis

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Keywords
economic development, economic growth, labor force, female workers, Middle East

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This paper investigates the relationship between economic development and female labor force participation in the Middle East and North Africa (MENA). Using a panel data set of 20 countries in the region for the period of 1990-2012, I develop an econometric model that tests the U-shape hypothesis. This study builds upon previous literature examining the U-shape hypothesis in time series studies for developing countries, and cross-country studies. The results of this paper suggest that there is a U-shaped relationship between economic growth and female labor force participation rates. The MENA region's low female labor force participation rates can be explained in part by their transition towards the bottom of the U-shaped curve.

I. Introduction

The Middle East and North Africa (MENA) region has the lowest female labor force participation rates in the developing world (Verme, 2014). Despite moderate economic growth, gains in female education, and drops in fertility rates, female labor force participation rates have stayed incredibly low in the region. In some cases, the participation rates have even fallen over the past few decades, as is the case in Morocco. Are countries in the MENA region just at the turning point of the U curve, or are there other unknown factors at play?

Understanding the relationship between economic development and female labor force participation is important for a variety of reasons. The U-shape hypothesis suggests that there is a sort of tradeoff between gender equality and economic growth during a country’s development. Studying this relationship is important for academics and policy makers alike to identify trends in labor force participation and to design and implement policy to that end.

Prior research has established a U-shaped relationship between female labor force participation and economic development. There is a considerable amount of literature that has provided cross-country evidence for the hypothesis (Boserup, 1970; Durand, 1975; Psacharopoulos, 1989; Kottis, 1990; Goldin, 1995; Tam, 2011), as well as time series studies for developed countries such as the United States (Goldin, 1995). Few papers have tested the U-shape hypothesis within the context of developing regions and countries, however (Tansel, 2001). Even fewer have done econometric research focused specifically on the MENA region (Verme, 2014; Tsani, 2012). Recent papers studying the U-shape hypothesis have utilized more sophisticated econometric methods and have found less robust evidence for the hypothesis (Gaddis, 2013; Verme 2014).

In the next section of this paper I will discuss the theory and evidence behind the U-shape hypothesis. After that I will describe the model used, derived from previous literature (Gaddis, 2013; Verme, 2014). In the following section I will describe the data collected to test the U-shape hypothesis. In the final sections I will present my results, limitations and conclusions.

II. Literature Review

The U-shaped hypothesis states that at the beginning of economic development, when agriculture dominates the economy, more women participate in the labor force. Typically fertility rates are still high, but most women have the ability to work and raise children by working on their family farms or by creating household businesses. As a country's economy undergoes structural changes and transitions from agriculture to industry though, women's labor force participation rates tend to fall. Women are unable to take advantage of work opportunities in formal and industrial sectors during the early stages of economic development. Fertility rates are still high, but the move from agriculture to industry limits their ability to work and raise children, lowering labor force participation. Women are also restricted from entering the labor force because of lower levels of female education. In fields that require heavy manual labor, social stigma against female workers lowers the labor force participation rate as well. Consistent with basic labor economic theory, as there is an overall increase in productivity and family earnings, there is a negative income effect on female labor supply (Gaddis, 2013).

In later stages of economic development, as female education increases, fertility rates decline, and socio-cultural attitudes evolve, the participation rate increases (Goldin, 1995). The emergence of white-collar sectors provide new employment opportunities for women that are not subject to the same social stigmas. Moreover, increasing access to childcare facilities and the availability of part-time jobs allow women to work outside the home while raising children. By this point, the substitution effect leads to higher potential female wages which overcomes the income effect, raising female labor force participation as income per capita rises (Gaddis, 2013).

Cross-country studies have found consistent evidence for the U-shape hypothesis. Goldin (1995) found that the relationship held for a group of about 100 countries in both 1980 and 1985. Mammon and Paxson (2011), using data from 90 countries from the 1970s to the 1980s, also found similar evidence. Psacharopoulos and Tzannatos (1989) looked at a set of 136 countries between 1960 and 1980 and also found a U-shaped relationship. They argue that high and low income countries have the highest female labor force participation rates. Tam (2011), found similar results using panel data for a set of 134 countries from 1950-1980.

Goldin (1995) also examined time-series data for a study on the United States and found evidence for the U-shape hypothesis. Female labor force participation fell during the early stages of economic growth and rose later as development continued. Similar results were found by a study done by Tilly and Scott (1987) for England and France, other developed nations. There are fewer studies on developing countries due to a lack of data. Tansel (2001), examined time series evidence on provinces in Turkey and found evidence for the U-shaped hypothesis.

Gaddis (2013) found less robust evidence for the U-shape hypothesis testing both a static (OLS and fixed effects) model and a dynamic (autoregressive) model. This paper used cross-country data from 1980-2005 and found that the results for the U-shape hypothesis were very sensitive to the data source used. The study also found little support for the structural change hypothesis from agriculture to industry as an explanation for low female labor force participation on the declining side of the U curve. The paper did find that fertility and education had a role in explaining the rising side of the U curve. Gaddis (2013) also estimated separate regressions for OECD and non-OECD countries and found no evidence for the U-shaped relationship among non-OECD countries. They concluded that, “while it remains possible that todays advanced economies transitioned through the U over the course of their economic development, the U-shape seems to have little relevance for most developing countries today” (Gaddis, 2013 pp. 26).

To the best of my knowledge, only two papers have examined the U-shape hypothesis in the MENA region, Tsani (2013) and Verme (2014). Tsani (2013) tested the U-shape hypothesis and region-specific effects for the MENA and used the resulting coefficients to compute a general equilibrium model. The paper used data from the International Labour Organization and the World Bank. The model employed used control variables for education, fertility, urbanization, religious norms, and unemployment rates. The estimation results were robust with the control variables, and found evidence for the determinants of female labor force participation rates as well as the U-shape hypothesis.

Verme (2014) divided analysis between parametric and nonparametric evidence using data collected from the International Labor Organization and the World Bank. The researcher's nonparametric evidence showed that the U-shape hypothesis held both worldwide and within the MENA region itself. The paper suggested that MENA countries are at the turning point of the U-shaped curve, explaining their low female labor force participation rates. The parametric evidence did not hold as strongly though, with some countries in the region showing non-significance or even an inverted U-shape. The paper used a model similar to Gaddis (2013) and also suggested that the U-relationship had little relevance for developing countries.

The literature also provides a full discussion of the determinants of labor force participation, the pillars of the U-shape hypothesis. Labor force participation decisions seem to be jointly determined by the individual women and their households as well as by overall market conditions. Education has a positive effect on female labor force participation, by increasing the potential earnings made by the women as well as increasing the opportunity cost of not working (Tsani, 2013; Tansel, 2001). Also, higher education rates are usually accompanied by lower fertility rates which can increase female labor force participation. Fertility itself is expected to have a negative correlation with female labor force participation (Lin, 2011). As socio-cultural attitudes change and women's productive versus reproductive roles are valued, more and more women enter the labor force.

The literature suggests that female labor force participation is affected by economic growth, unemployment and urbanization. The effects of unemployment can sometimes be ambiguous. The higher the unemployment rate, the less likely a women will be able to find a job (even as opposed to a man in the MENA). The “discouraged worker” hypothesis implies that unemployment has a negative effect on labor force participation (Tsani, 2013). The degree of urbanization may affect the number of jobs available to women. Urban areas tend to have more employment opportunities, and can sometimes be more liberal in terms of socio-cultural attitudes. Thus, the greater number of urban areas in a country, the higher female labor force participation will be (Tsani, 2013).

III. Model

As discussed in the previous section, there is a considerable amount of evidence to suggest the U-shaped relationship between economic development and female labor force participation rates using cross-sectional methods. Typically GDP per capita is used as a proxy for economic development. The model used in the literature to test the hypothesis has been:

$$FLFPR_i=\alpha+\beta_1 \ln y_i+\beta_2(\ln y_i)^2+u_i$$

Y_i is GDP per capita, with *i* acting as a subscript for countries. The U-shape hypothesis holds if the estimated coefficients are as follows: $\beta_1<0$ and $\beta_2>0$. This is a simple cross-country equation and is applied to one point in time in the literature.

With more data, allowing for panels to be created, the model has also been transformed to:

$$FLFPR_{it}=\alpha+\beta_1 lny_{it}+\beta_2(lny_{it})^2+u_{it}$$

This is still a cross sectional model, because the coefficients only measure the average change in female labor force participation rates as GDP changes. This model ignores time and country specific effects, but has been used in the literature to find evidence for the U-shape hypothesis. The OLS estimator is incredibly biased without correcting for time-invariant heterogeneity.

A more appropriate model uses a fixed effects estimator, which controls for country specific effects (Gaddis, 2013; Verme, 2014).

$$FLFPR_{it}=\alpha_i+\beta_1 lny_{it}+\beta_2(lny_{it})^2+\delta_t+u_{it}$$

This controls for time-invariant, country factors effecting female labor force participation. δ_t is the fixed effects. This model is still not optimal, because if female labor force participation does not vary much over time, lagged female labor force participation is correlated with the error term. The regressors are most likely endogenous as well, introducing further issues. A linear dynamic panel data model could correct for these issues but such methods are beyond the scope of this paper. Estimation using instrumental variables and Two Stage Least Squares could also be used. but proper instrumental variables were not found.

This paper's model will be similar to the ones used by Gaddis (2013), and Verme (2014), but will use the control variables provided by the model employed by Tsani (2013).

$$FLFPR_{it}=\alpha_i+\beta_1 lny_{it}+\beta_2(lny_{it})^2+\beta_3 educ_{it}+\beta_4 fert_{it}+\beta_5 unem_{it}+\beta_5 urban_{it}+t+\delta t+u_{it}$$

The added variables include controls for education, fertility, unemployment, and urbanization. A time trend is also included. For the U-shape hypothesis to hold, I would expect $\beta_1<0$ and $\beta_2>0$. For the control variables, I would expect the coefficients on education and urbanization to be positive, and the coefficients on unemployment and fertility to be negative. These results would be consistent with the arguments made in the literature which were discussed in the previous section.

IV. Data

Data for all of the variables was collected from the World Bank's World Development Indicators database. Female labor force participation is defined as the number of females aged 15 and up who are in the labor force divided by the total female population. Economic growth is controlled for using GDP/capita in current U.S. dollars. GDP per capita is the gross domestic product divided by the midyear population of the country. The control variable for education used was the percentage of female students in secondary education. This is defined as the total number of females in secondary school over the total number of students enrolled in secondary education. Fertility was controlled for using the fertility rate in each country. The total fertility rate is the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children during that time. Unemployment rates are defined by the share of the labor force that is without work and is available and seeking employment. Urbanization is controlled for with the urban population percentage, or the total number of people living in urban areas over the total population of each country (World Bank).

The econometric approach used pooled panel data for a set of 20 countries for the period of 1990-2012. This is the same data used by many of the cross-country studies reviewed in the previous section. The data set is an unbalanced panel, with several observations missing over different variables, countries, and years. The reasons for some of the missing observations might be correlated with the idiosyncratic errors, which could lead to biased and inconsistent estimators. Collecting data in the MENA region has always been fraught with difficulties though, and there is no available data set or method to account for these missing observations.

Table 1 – Summary statistics

Variable	**Observations**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
FLFP	460	24.64	11.23	9.20	58.10
GDP per capita	432	10,323.71	13,946.88	283.58	92632.68
% females secondary education	352	47.32	4.10	26.04	53.26
Fertility rate	460	3.45	1.30	1.50	8.67
% urban population	460	70.98	17.83	20.93	98.95
% unemployment	440	10.39	6.23	0.30	30.7

There is wide heterogeneity across MENA countries in terms of GDP per capita and urbanization rates. There is quite a difference between the Gulf region (Saudi Arabia, Qatar, Kuwait, and the United Arab Emirates), and the rest of the MENA. This could complicate estimation of the regression model, with the outliers biasing the coefficient estimates, but with such a small sample of countries over time, observations should not be dropped.

V. Empirical Results

Results for the regression estimated by OLS are shown in Table 2. The regression output confirms the U-shape hypothesis, with similar results to those found in the literature. The GDP per capita variables are both statistically significant, with $\beta_1<0$ and $\beta_2>0$. In the past, results from this type of estimation have been used as evidence for the U-shape hypothesis, but as stated previously, pooled OLS estimation is biased in the presence of unobserved, time-invariant effects.

Table 2 – OLS Regression

Variable	Coefficient	Standard Error
GDP/capita	-22.76***	4.80
GDP/capita²	1.58***	0.27
Education	-0.84***	0.13
Fertility	-2.02***	0.43
Urbanization	0.14***	0.05
Unemployment	-0.29***	0.08
Time trend	-0.18***	0.07

Significance level: ***=.01; **=.05; *=.1

The results for the fixed effects estimation of the model are shown in Table 3. The econometric estimation also confirms the U-shap hypothesis on the relationship between economic growth and female labor force participation with $\beta_1<0$ and $\beta_2>0$. The coefficient estimates are statistically significant for both GDP per capita variables. A period of 22 years may be too short to observe a full U-shape but the results suggest that there is one. The within R^2 of the model was 56%. This is the amount of time variation in y_{it} that can be explained by the time variation in the explanatory variables.

Table 3 – Fixed Effects Regression

Variable	**Coefficient**	**Standard Error**
GDP/capita	-10.96***	2.51
GDP/capita²	0.55***	0.13
Education	-0.63***	0.11
Fertility	-2.34***	0.34
Urbanization	0.05	0.10
Unemployment	-0.10*	0.05
Time trend	0.25***	0.05

Significance level: ***=.01; **=.05; *=.1

The coefficient on fertility rates was found to have a statistically significant, negative effect on female labor force participation, in line with theory from the literature. Unemployment rates also had a statistically significant negative effect, although the magnitude of the coefficient was quite small. The coefficient on urbanization was not statistically significant and had a small positive effect on female labor force participation.

The coefficient estimate on education is the most puzzling, having a negative sign and implying that increased education leads to lower female labor force participation rates. This may be explained by the fact that although secondary education rates have increased dramatically over the past 30 years, this has not translated into increased labor force participation. Female labor force participation rates have remained stagnant despite gains in secondary and tertiary education for women in the MENA region (Verme, 2014).

The most important assumption for using fixed effects is the strict exogeneity assumption. This holds if the idiosyncratic error in each year is uncorrelated with the explanatory variables in all time periods. Using fixed effects, we allow some variables to be correlated with unobserved effects that are constant over time. It is probably not reasonable to assume that the dependent variables are uncorrelated with the errors. Strict exogeneity can be overcome if enough time-varying factors have been controlled for, but clearly there are more variables effecting female labor force participation that are not included in the regression model. These include variables to control for gender and social norms, which have been shown in qualitative research to have an important impact on female labor force participation.

The other assumptions needed to estimate using fixed effects are that the errors in the regression are homoscedastic and serially uncorrelated. Testing for serial correlation there is strong evidence of serial correlation in the errors (p-value=0.00). This means that the test statistics for the estimated regression are invalid. It is difficult to test for serial correlation after fixed effects estimation, but the time-demeaned errors can be used for all of the usual tests.

Testing for hetroskedasticity, there is also strong evidence that it exists (p-value=0.00). With the presence of heteroskedasticity and serial correlation, I applied fixed effects to a cluster sample. Each country, or cross-sectional unit is treated as a cluster of observations over time. Serial correlation, and changing variances are allowed for in each cluster. Using this approach, the standard errors are raised across all of the explanatory variables, as seen in the regression output in Table 4.

Table 4 – Fixed Effects Regression with robust errors

Variable	Coefficient	Standard Error
GDP/capita	-10.96**	5.16
GDP/capita^2	0.55*	0.27
Education	-0.63**	0.23
Fertility	-2.34***	0.66
Urbanization	0.05	0.22
Unemployment	-0.10	0.08
Time trend	0.25*	0.14

Significance level: ***=.01; **=.05; *=.1

The GDP per capita coefficients were still statistically significant, as well as the coefficients for the time trend, education and fertility variables. The coefficients for urbanization and unemployment were not statistically significant after using robust standard errors.

This method still does not properly account for the fact that lagged female labor force participation is correlated with the error term. GDP per capita is an endogenous variable, and there is a feedback loop between female labor force participation rates and GDP per capita which biases the coefficient estimates. A linear dynamic panel model using Generalized Method of Moments (GMM) with instrumental variables can accommodate for endogeneity and autocorrelation. Past papers have used this method, but it is beyond the scope of this paper. Two Stage Least Squares could also be used to account for the endogeneity of GDP per capita, but a proper instrumental variable could not be found.

VI. Conclusions

This paper looked at the relationship between female labor force participation and economic growth in the MENA region. It has done so by using a fixed effects model with control variables for education, fertility, unemployment, urbanization and a time trend. The econometric results provided evidence for the U-shape hypothesis in the MENA region. There is wide heterogeneity across MENA countries, but it was still possible to establish a relationship between female labor force participation and economic growth over the time period analyzed.

The MENA region has made significant strides in reducing gender gaps in human development over the past few decades. This has not translated into improvements in female labor force participation, however (Verme, 2014). This suggests that there might be other factors discouraging women from participating in the labor force. Understanding the relationship between economic development and female labor force participation will help isolate in which areas the MENA region lags behind the rest of the developing world in terms of getting more women into the work force. This paper's results suggest that part of the region's low female labor force participation rates can be explained by its transition towards the bottom of the U-shaped curve.

There were three problems with the estimated model, however. One, it only examined a short period of time. Data on most explanatory variables is only available starting in 1990 and this may be too short of a time period to observe a U-shaped transition. Until longer time series are made available for the region, this is not an issue that can be solved. The second problem with the model employed in this paper is that it did not control for another main pillar of the U-shape hypothesis, social and cultural norms relating to gender. These are important factors, but at the moment there is a lack of data relating to cultural factors to explain female labor force participation. Historically determined, initial factors may be more important in determining labor force participation rates as well. Without having the proper control variables in place for things like culture and gender norms, it may not be possible to properly estimate the relationship between economic development and female labor force participation rates. The final problem with the model employed is that it didn't fully correct for endogeneity, serial correlation, and heteroskedasticity. Without controlling for these issues, the results are less than trust worthy.

Finally, finding a statistically significant U-shaped relationship in cross-sectional analysis across countries does not mean that the relationship holds across individual countries (Gaddis, 2013). A limitation of past research, and of my research, is that cross-sectional models have been used on panel data. As Gaddis (2013) points out, "Data on female labor force participation from countries at different income levels are used to infer the relationship within a single country over time" (pp.12). The

U-shape hypothesis is about changes over time in an individual country, and cross-sectional results shouldn't be an adequate test of the hypothesis. Until longer time series become available for countries in the MENA region, the U-shape hypothesis cannot be properly tested.

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