Kuznets' Hypothesis and Gender Inequality

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Abstract: The purpose of the paper is to examine whether the Kuznets hypothesis of the inverted U-shape relationship between the level of income inequality and the level of gross domestic product per capita GDP per capita is also applicable on the relationship between gender inequality and the level of GDP per capita. The paper assumes that government intervention in the early stage of economic development is essential to reduce income inequality. The paper also assumes that government intervention and public goods provision help to narrow the gender gap in education and health but not in employment and income. The paper looks for the evidence of Kuznets 'hypothesis for gender inequality by examining the level of gender inequality in single countries over time and by looking at single points in time in a cross-section of countries with different level of income and economic development.

Key words: gender inequality, Kuznets income inequality hypothesis, economic development, government intervention

I. Introduction

Kuznets (1955) in his pioneering article "Economic Growth and Income Inequality "on The American Economic Review, introduced the new idea of a non-linear relationship between income inequality and economic development. Kuznets argued that in the early stages of development, the rich people in the agriculture sector accumulate more wealth than the poor. As a consequence, the income distribution becomes more unequal and income inequality increase with the transition from the traditional activities to the manufacture activities. However, Kuznets argued that as the level of aggregate income has reached a certain level, income inequality declines and almost disappears during the latter stages of economic development. Therefore Kuznets hypothesis is that the relationship between the distribution of income and the degree of development forms an inverted U-shaped function. The inverted U shape function

and curvilinear relationship is used intensively theoretically and empirically to explain the relationship between gender inequality(measured with different indicators) and economic development in both developed and developing countries in rich and poor countries and in countries at different levels of economic development. However, some pioneering economists such as Boserup (1970) and Godwin (1994) believe that the relationship between economic development and gender equality is not linear and that economic development is associated first with increase in income inequality followed by periods of convergence among men and women after the economy reaches a certain level of economic growth and aggregate income goes beyond a certain threshold.

The purpose of the paper is to examine whether the Kuznets hypothesis of the inverted U-shape relationship between the level of income inequality and the level of gross domestic product per capita GDP per capita is also applicable on the relationship between gender inequality and the level of GDP per capita. The paper assumes that government intervention in the early stage of economic development is essential to reduce income inequality. The paper also assumes that government intervention and public goods provision help to narrow the gender gap in education and health but not in employment and income. The paper looks for the evidence of Kuznets 'hypothesis for gender inequality by examining the level of gender inequality in single countries over time and by looking at single points in time in a cross-section of countries with different level of income and economic development.

II. Literature Review

III. According to the Global Gender Gap report 2014 the relative gaps between women and men can be measured for the gender equality in health, education, economy and politics Gender inequality in education, in health care, labor market and in political presentation is still a serious problem in most if not all developing countries.

Cubers and Teiger 2014 provide a very significant critical survey of the most important theoretical and empirical literature on the relationship between gender inequality in different dimensions and economic growth from a macroeconomic perspective. In the review of theoretical literature of the relationship between gender inequality and economic growth

they divided theses literature into three parts: theories that show how economic growth helps to reduce gender inequality, theories that show that both gender inequality and economic growth affect each other and theories that quantify the effects of a decline in gender inequality on economic growth. Their survey shows that the three main channels through which economic development lead a decline in gender gaps re the income elasticity, technological progress and changes in women's property rights. Their survey of two-way relationship between gender inequality and economic growth shows that gender inequality and economic growth are simultaneously affect each other where economic growth causes reduction in fertility and therefore demographic transition and faster economic growth. They also survey models that show how gender inequality affects gross domestic product and economic growth through the impact of the society's stock of talented people.

Author(s)	Country(ies)	Method	Main Results
Boserup (1970)	Countries at different income levels of	Theoretical model and Graphical presentation.	The study argues that, while the gender equality decreases at the initial stages of economic development, it then increases when the country develops beyond a certain threshold. This finding agrees with the inverted-U shaped pattern of income inequality first revealed by Kuznets (1955).
Pampel and Tanaka (1986)	estimate models using 70 nations with different levels of income at two different time points, 1965 and 1970,		The study determined how the economic development affects gender equality. They find that at the initial levels, development actually excludes females from the labor force, but at more advanced levels, increasing development causes an expansion of female

			labor force participation, which decreases gender inequality. The study finds that in countries with higher and lower income levels women's participation rates are higher than their participation in countries with middle income levels.
Psacharopoulos and Tzannatos (1989)	136 countries in the early 1980s.		The findings reveal that the female labor force participation initially decreases, and then increases after a certain level of economic development is achieved in the period of transition from agrarian subsistence economy.
Kottis (1990)	Greece		The study concludes that the decrease in women's activity rates in Greece is explained by the U-shaped effect of economic development.
Goldin (1994)	more than 100 countries and the historical data from United States	Theoretical model &graphical presentation of historical data	The paper concludes that the labor force participation of married females first declines, and then rises after a threshold of economic development is reached. The labor force participation rate of married women first declines and then rises as countries develop. The relationship between female labor force participation and economic development is U-shape. The paper assumes that the decline in

			the participation rate at the first stage of economic development is due to the movement of production from the household, tmily farm, and small business to the wider market. The income effect in this first stage of economic. the income effect weakens and the substitution effect become more important
Lancitan et al. (1996)	Asian countries		A test of the impact of economic growth on gender inequality with time-series data for a set of Asian countries supports Kuznets's theory that income growth leads to an eventual decrease in gender inequality in the long run
Forsythe et al. (2000)			They find a longitudinal evidence of a curvilinear relationship between economic growth and gender inequality. They state that the economic development should aim to increase gender equality, since the increased status of women creates more social integration, and also improves investment in human capital.
Tam (2011)	130 countries over 31 years	makes dynamic panel data estimation	The results suggest that the U-shaped pattern in the relationship between female labor force participation and economic growth seems to hold.
Eastin and	146 countries for the	Estimate a	The paper suggests a curvilinear

Prakash (2013)	period 1980-2005.	model including the cubic specification of income per capita to determine the behavior of gender equality in the subsequent stages of economic development	relationship of gender equality and economic development in the form of S-shaped GKC, in which the second and third phases of economic development coincide with the U-shaped pattern of gender equality.
Dilara Kilinc, Esra Onater, and Hakan Yethinker 2013	G7 countries: United States, United Kingdom, France , Canada, Japan, Germany and Italy.	Auto-Regressive Distributed Lag (ARDL) bounds testing approach	The results show that the bounds F-test for cointegration yields evidence that there is a cubic GKC relationship for France (inverted S-shaped) and for Japan a (S-shaped) and a quadratic GKC relationship for Canada, United Kingdom and United States (all inverted U-shaped). But no long-run relationship is found for Germany and Italy, irrespective of the GKC specification
Nooreen Mujahid and Naeem uz Zafar	Pakistan	The autoregressive distributed lag modeling or the ARDL bounds testing approach	The results show the existence of long run and U-shaped relationship between economic development and female labor force participation in case of Pakistan. The study also shows that an increase in

		developed by Pesaran et al. (2001)	education and dynamics of economic activity have positive impact on the female labor force participation in later stage of development.
Haas, Sherri	154 countries	Cross-sectional data for the dependent variable, a ratio of male-to-female earnings. The estimated earned income for men and women in US purchasing power parity dollars between 1991 and 2003.	The results of the study show the presence of a Kuznets inverted-U relationship between GDP per capita and gender wage inequality across nations.
Tansel, Aysit	panel data on the 67 provinces of Turkey, in 1980, 1985 and 1990.	Theoretical model & Ordinary Least Squares (OLS) estimation using pooled data	the cross-section over province estimates in Turkey confirm the U-shaped hypothesis between female labor force participation and level of economic development

IV. Gender Inequality in developing countries

	GNI per capita	Poverty headcount ratio of $1.25 a	Fertility rate ,total births per	Share of women employed in the nonagricultural sector (% of total	Proportion of seats held by women in national

	current US$	day(ppp)% of population	woman)	nonagricultural employment)	parliaments %
South Asia					
East Asia	$5,536 2013	7.9% 2011	1.9 2012	39%	19% `2014
Europe and central Asia	$7,118 2013	0.5% 2011	2.0 2012	43% 2012	18% 2014
Sub-Saharan Africa	$1,657 2013	46.8% 2011	5.1 2012	N/A	23%
Middle East and North Africa	$3,456 2009	1.7% 2011	2.8 2012	17% 2010	17%

V. The assumptions and theoretical model

This study assumes that

1. in the process of economic development in developing countries the relationship between gender inequality and economic development is non-linear relationship. The paper considers that economic development begins with the transformation of the developing economy from traditional activities to modern activities; therefore the high level of female participation in the labor force in traditional activities in the agrarian sector which most likely is unpaid for is not counted as high levels of female participation in the labor force.
2. The female participation in the work during the traditional production period is not considered because women were obliged to work within the family farm and in the household and they were not paid for their activities. Therefore, the traditional activities period is considered as the pre-economic development process.
3. For developing countries, the paper assumes that economic development process took three stages of development so far. The first phase of economic development occurred in the 1950s, 1960s and continued until the mid of the 1970s and was characterized by greater government intervention in economic activities and the public provision of essential goods and services such as education, housing and health care and government employment for educated men and women. The gender gap in the first stage of economic development at all dimensions; in economic participation and opportunities, in education attainment, in health and survival and in political empowerment narrowed. The first stage of economic development can be based on economic development experiences in Eastern Europe countries, in North Africa specifically in Egypt and Tunisia, in most countries in Sub-Saharan Africa and even in China and other south East Asian countries.

4. The second phase of economic development starts in the mid 1970s with structural changes in the economic development strategies in developing countries towards market oriented, openness and reform strategy. This phase of economic development is known as open door policy in Egypt and open and reform in China. The main component of the new strategy of economic development is the gradual fall in government intervention in economic activities, fall in government expenditure on public goods and services and fall government employment provision of educated male and female graduates. Private domestic and foreign sector was assumed to lead economic development and provide employment opportunities. The second phase was a period with high Income Inequality and many economic reforms were undertaken such as special economic zones and regulations to attract foreign direct investment.
5. However, in the second stage of economic development governments in developing countries continue to provide low quality free education and health care and to impose women political participation through recruiting women at senior positions in the people's assembly.
6. During the second economic development phase the gender gap among middle and low levels of income brackets widens at all dimensions: in economic participation especially in labor force participation, in quality education attainment and in quality health services received.
7. The gender gap almost continue to fall among high income classes, rent seeking and rich people who could provide their women with high quality private education and senior officials and managerial employment with high earned income.
8. The third stage of economic development begins with more market-oriented economic development policies associated with external factors both globalization and financial crises.
9. The paper assumes the relationship between gender inequalities is curvilinear taking the U shape where gender inequality declines at first stage of economic development due to government intervention and public provision of education and health services and then gender inequalities increases in the second and third stages of economic development. The overlap between phase II and phase III of economic development makes the lower part of the U to stretch and expand.

VI. The Econometric Methodology

Step 1: state the hypothesis

"The Gender Kuznets Curve (GKC) hypothesis assumes s that economic development has a non-linear effect on the gender inequality and specifically this non-linear effect is inverted U shaped. The paper assumptions are the existence of a non-linear effect of economic development on gender inequality and second that curvilinear effect is U shaped."

Step 2: Specification of the econometric model :

In order to verify the existence of the inverted U curve in the relationship between gender inequality and economic growth, the paper uses alternative function specifications to capture the shape of the true relationship. First the paper considers the function specification often used to verify the existence of Kuznets' inverted U curve between gender inequality and economic growth. This first function specification is a polynomial model used to show the parabolas relationship between gender inequality and economic growth and may be presented as follows:

$$GI_{it} = \alpha + \beta_1 \, GDPP_{it} + \beta_2 \, GDPP^2{}_{it} + u_i \qquad (1)$$

In equation (1) GI_{it} stands for gender income inequality measure and $GDPP_{it}$ is gross domestic product per capita at purchasing power parity and the index i refers to cross identifiers the developing countries used in the paper and t refers to the time period of 1998 and 2012. In this equation if $\beta_1 > 0$ and $\beta_2 < 0$ the parabola is inverted U meaning that gender income inequality first increase with the increase in gross domestic product per capita and then declines with economic growth then Kuznets's inverted U shaped curve is verified for gender income inequality. However, if $\beta_1 < 0$ and $\beta_2 > 0$ the parabola is U shaped and then our assumption of a U shaped relationship between gender inequality and economic growth is verified where gender inequality first declines with government led- economic growth and then increases with market led economic growth.

The second function specification adds a cubic $GDPP^3{}_{it}$ to verify the direction of the relationship between gender inequality and economic growth. According to our assumption $\beta_3 > 0$ to indicate that as economic development in third stage continue associated with external factors such as globalization and financial recession gender inequality continues its path upward.

$$GI_{it} = \alpha + \beta_1 GDPP_{it} + \beta_2 GDPP^2{}_{it} + \beta_3 GDPP^3{}_{it} + u_i \quad (2)$$

The third function specification other independent and control variables are included.

$$GI_{it} = \alpha + \beta_1 GDPP_{it} + \beta_2 GDPP^2{}_{it} + XA + u_i \quad (3)$$

In this third equation (3) we introduce other variables that might affect gender income inequality as well. X is the matrix of control variables and A is a vector of parameters associated with these control variables. The control variables included are government spending on education, government spending on health, FDI inflows and the quality of education.

Step 3 data

Dependent Variables

For the purpose of econometric estimation, this paper focuses a measure of gender inequality in participation in the labor force. Three variables are used to measure gender inequality in labor force participation:

1. the Labor force participation rate, female (% of female population ages 15+) (modeled ILO estimate)[1], FP
2. the Labor force participation rate, female (% of female population ages 15-64) (modeled ILO estimate)[2] LFFF
3. the Ratio[3] of female to male labor force participation rate (%) (Modeled ILO estimate). LFFM

[1] Labor force participation rate, female (% of female population ages 15+) (modeled ILO estimate): Labor force participation rate is the proportion of the population ages 15 and older that is economically active: all people who supply labor for the production of goods and services during a specified period. International Labor Organization, Key Indicators of the Labor Market database

[2] Labor force participation rate, female (% of female population ages 15-64) (modeled ILO estimate): Labor force participation rate is the proportion of the population ages 15-64 that is economically active: all people who supply labor for the production of goods and services during a specified period. International Labor Organization, Key Indicators of the Labor Market database.

[3] Ratio of female to male labor force participation rate (%) (modeled ILO estimate):Labor force participation rate is the proportion of the population ages 15 and older that is economically active: all people who supply labor for the production of goods and services during a specified period. International Labor Organization, Key Indicators of the Labor Market database.

4. The Gender Inequality Index is also used as a dependent variable: According to the Human Development Report 2014 the Gender inequality index is a composite measure reflecting inequality in achievement between women and men in three dimensions: reproductive health, empowerment and the labor market. GDI

VII. Empirical results

1. Descriptive statistics:

	FP?	LFFF?	LFFM?	GDPP?
Mean	52.57284	55.40000	68.23571	6064.912
Median	53.45000	57.70000	72.74479	4440.919
Maximum	88.10000	90.00000	107.1166	22517.10
Minimum	10.50000	10.70000	15.42484	346.3875
Std. Dev.	18.30666	18.51082	21.82594	5037.403
Skewness	-0.226205	-0.397954	-0.565973	1.103469
Kurtosis	2.512358	2.625964	2.514414	3.538267
Jarque-Bera	4.277216	7.475930	14.66526	49.88298
Probability	0.117819	0.023802	0.000654	0.000000
Sum	12196.90	12852.80	15830.69	1407060.
Sum Sq. Dev.	77415.92	79152.26	110041.8	5.86E+09
Observations	232	232	232	232
Cross sections	116	116	116	116

2. Method used: Pooled Least Squares

Included years 1998 and 2012 and Cross-sections (developing countries) included: 116 -

Total pool (balanced) observations: 232

Table 1: Endogenous variable LFFM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	87.43747	2.839211	30.79639	0.0000
GDPP?	-0.005735	0.000824	-6.963266	0.0000
Square GDPP?	2.51E-07	4.43E-08	5.669734	0.0000

R-squared	0.201598	Mean dependent var	68.23571
Adjusted R-squared	0.194625	S.D. dependent var	21.82594

S.E. of regression	19.58719	Akaike info criterion	8.800475
Sum squared resid	87857.65	Schwarz criterion	8.845045
Log likelihood	−1017.855	Hannan−Quinn criter.	8.818450
F−statistic	28.91142	Durbin−Watson stat	0.242964
Prob(F−statistic)	0.000000		

Table 2: Endogenous Variable LFFM

Variable	Coefficient	Std. Error	t−Statistic	Prob.
C	93.32880	3.871229	24.10831	0.0000
GDPP?	−0.009551	0.001905	−5.013495	0.0000
Square GDPP?	7.49E−07	2.29E−07	3.272932	0.0012
Cubic GDPP?	−1.66E−11	7.48E−12	−2.217102	0.0276

R−squared	0.218448	Mean dependent var	68.23571
Adjusted R−squared	0.208164	S.D. dependent var	21.82594
S.E. of regression	19.42185	Akaike info criterion	8.787765
Sum squared resid	86003.47	Schwarz criterion	8.847192
Log likelihood	−1015.381	Hannan−Quinn criter.	8.811731
F−statistic	21.24235	Durbin−Watson stat	0.209251
Prob(F−statistic)	0.000000		

Table 3 Endogenous variable is LFFF

Exogenous variables	Coefficients	Standard Error	t−Statistic	Probabilities
Constant	77.64285	3.254410	23.85773	0.0000
GDP per capita (in US $ PPP)	−0.008542	0.001602	−5.333771	0.0000
Square of GDP per capita	6.88E−07	1.92E−07	3.577820	0.0004
Cubic of GDP per capita	−1.60E−11	6.29E−12	−2.541138	0.0117

R−squared	0.232109	Mean dependent var	55.40000
Adjusted R−squared	0.222005	S.D. dependent var	18.51082
S.E. of regression	16.32728	Akaike info criterion	8.440643

Sum squared resid	60780.29	Schwarz criterion	8.500070
Log likelihood	−975.1146	Hannan−Quinn criter.	8.464609
F−statistic	22.97240	Durbin−Watson stat	0.210738
Prob(F−statistic)	0.000000		

Table 4 Endogenous variable LFFF

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	71.96638	2.394715	30.05217	0.0000
GDPP?	-0.004865	0.000695	-7.003787	0.0000
Square GDPP?	2.09E-07	3.74E-08	5.583427	0.0000

R-squared	0.210361	Mean dependent var	55.40000
Adjusted R-squared	0.203465	S.D. dependent var	18.51082
S.E. of regression	16.52069	Akaike info criterion	8.459951
Sum squared resid	62501.70	Schwarz criterion	8.504521
Log likelihood	-978.3543	Hannan-Quinn criter.	8.477925
F-statistic	30.50299	Durbin-Watson stat	0.240756
Prob(F-statistic)	0.000000		

Table 5 Endogenous variable is FP

Variable	Coefficient	Std. Error	t−Statistic	Prob.
C	70.78340	2.282761	31.00781	0.0000
GDPP?	−0.005186	0.000662	−7.831467	0.0000
Square GDPP?	2.13E−07	3.56E−08	5.993227	0.0000

R−squared	0.266374	Mean dependent var	52.57284
Adjusted R−squared	0.259967	S.D. dependent var	18.30666
S.E. of regression	15.74834	Akaike info criterion	8.364193
Sum squared resid	56794.31	Schwarz criterion	8.408763
Log likelihood	−967.2464	Hannan−Quinn criter.	8.382168
F−statistic	41.57412	Durbin−Watson stat	0.271967
Prob(F−statistic)	0.000000		

Table 6 Endogenous Variable Female participation in the labor force

Variable	Coefficient	Std. Error	t−Statistic	Prob.
C	76.74879	3.092789	24.81540	0.0000
GDPP?	−0.009050	0.001522	−5.946122	0.0000
Square GDPP?	7.18E−07	1.83E−07	3.924830	0.0001

Cubic GDPP?	-1.68E-11	5.98E-12	-2.810025	0.0054

R-squared	0.290931	Mean dependent var	52.57284
Adjusted R-squared	0.281601	S.D. dependent var	18.30666
S.E. of regression	15.51643	Akaike info criterion	8.338768
Sum squared resid	54893.22	Schwarz criterion	8.398194
Log likelihood	-963.2970	Hannan-Quinn criter.	8.362734
F-statistic	31.18282	Durbin-Watson stat	0.239744
Prob(F-statistic)	0.000000		

Conclusion

Preliminary empirical results reveal all measures of gender inequality in labor participation is linked to economic growth measured by gross domestic product per capita by a U shaped relationship and not an inverted U shaped relationship. The results do not verify the gender Kuznets curve hypothesis.[4] The coefficients of gross domestic product per capita in all function specifications is negative indicating that gender inequality decreases in the first stage of economic growth. The coefficients of square gross domestic product is positive in all equation specifications meaning that the relationship between gender inequality and economic growth is a U parabola and gender inequality increases in the second stage of economic growth with the implementation of open and reform economic development strategy. The adjusted R square is very weak in all function specification to indicate that gross domestic product per capita did not

[4] The empirical results are incomplete the equations including the control variable have not estimated.

explain in the most cases except third of the variations in gender inequality and that other explanatory variables should be carefully chosen and included.

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