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Does Gender Matter for Economic Convergence? The OECD Evidence

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Abstract

This work studies the role of gender on economic convergence in a standard convergence model expanded by gender shares of labor force. The theoretical part of the paper shows the positive role of gender on economic growth. Next, the paper presents 5-year span panel data tests of the contribution of the female share in employment on economic growth for 34 OECD countries in the period 1951-2010. We find that an increase in the share of women has a positive contribution to economic convergence across OECD countries. In addition to this, we also show that there is a U-shaped curvilinear relationship between gender equality and economic growth for OECD countries in the period 1951-2010. We conjecture that this result coincides with the 'S-shaped' Kuznets Curve of Gender hypothesis.

Keywords: Gender, Income Convergence, Economic Growth, Kuznets Curve of Gender

JEL classification: J16; O47; O50; C23

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JEL Classification: F23

Introduction

Despite the entry of females into the labor force in greater numbers, and the persistence of their employment for longer periods in the past few decades, gender differences still persist in labor force participation, in hours spent in paid and unpaid work, and in earnings. In all countries, men have greater opportunities for paid employment than women. Across the OECD, the average gender gap in employment to population ratio is 18%. This ratio is the smallest in Canada, Estonia, and in Nordic Countries that lies below 10%.[1] One positive trend is that gender segregation in labor market has been diminishing, especially in developed economies. Figure 1 below shows that the share of female workers is growing in those OECD countries which have low initial female shares, which we may perhaps call it 'gender convergence' in labor market.[2]

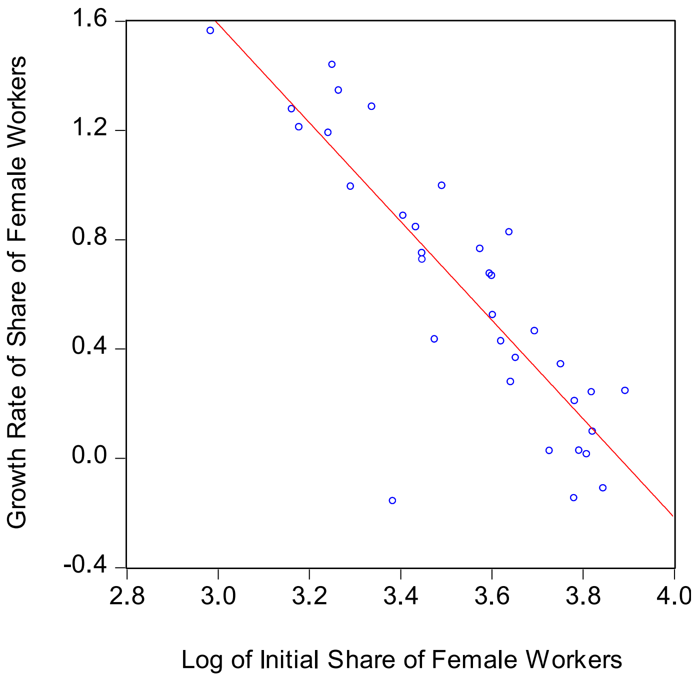

Figure 1. Gender Convergence

[1] OECD (2011).

[2] The data set includes the following OECD countries: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and the United States. The 5-year span data covers the time period 1956-2010 for share of female employment. Evidently, initial year for female share in employment is not 1956 for all countries; the data start from 1950's for 5 countries, from 1960's for 7 countries, from 1970's for 7 countries, and from 1980's for 7 countries. The initial years are 1990's for the remaining due to the data availability.

Source: International Labor Statistics

If gender convergence is true for OECD countries, the succeeding question is whether gender convergence has any impact on income convergence. The following figure shows that the higher the share of female workers, the higher the average growth rate of GDP per worker among OECD countries. As is clear, nonetheless, the evidence is very weak, and that when the same calculation is made for GDP per adult or GDP per capita, the evidence turns to slightly negative.[3]

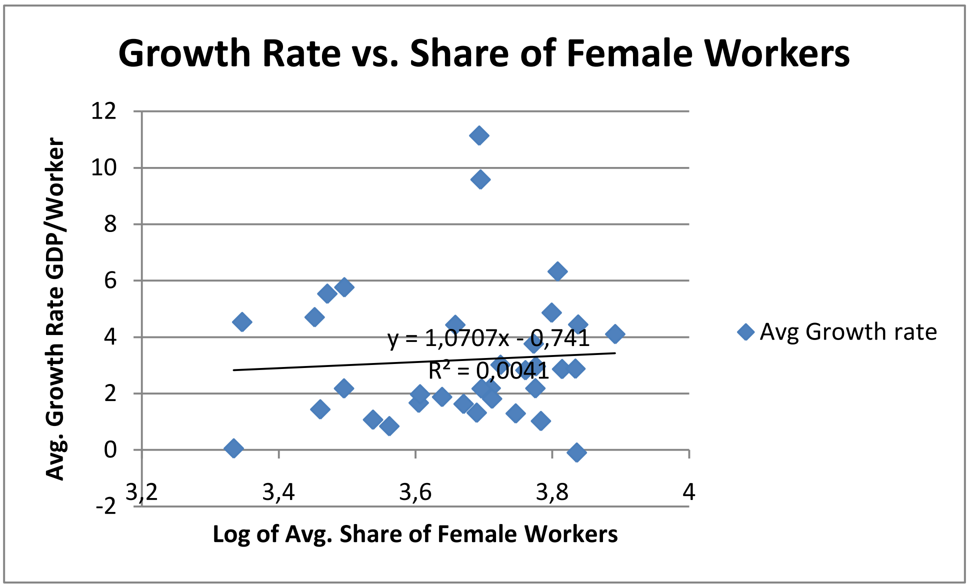

Figure 2. Average Growth Rate of GDP/Worker vs. Average Share of Female Workers

Source: International Labor Statistics and Heston et al. (2012)

Clearly, the (weak) evidence needs to be tested and studied in a scientific way. This study aims to address the question of whether or not the gender convergence that we observe among OECD economies has ever contributed to income convergence in the last 60 years. Two arguments can be made to explain why gender convergence may contribute to income convergence, preferably positively. First and foremost, the lower cost of female workers argument can be set forth. Across the OECD, on average, women are paid 16% less than men.[4] Standing (1999) states that there has been a rise in low-wage employment with the feminization of labor force and this has induced a substitution of women for men in the labor force.[5] On these grounds, the

[3] The data set has different data range for female employment shares, and the data range of GDP per worker is consistent with it. Authors may provide the data on request.
[4] OECD (2011).
[5] In accordance with Standing (1999), Cagatay and Ozler (1995) analyze the effect of the feminization of labor force on long-term economic development and argue that the rise in

increase in female share in employment decreases costs for labor, and may lead to an increase in production.[6]

Second, occupational segregation among gender has negative impact on income. Occupational segregation leads to the misallocation of the labor force and leads to the exclusion of competent female workers from productive work, which is instead undertaken by less able men, and this causes the decline in total productivity. For example, Seguino (2000) argues that the shifts of female workers from reproductive jobs to paid jobs have positive effects on family well-being, and this has positive macro-level effects. Hence, production decreases (increases), if occupational segregation increases (decreases). Similarly, Löfström (2009) argues the effects of female employment on income growth for EU countries and finds that if women worked on the same terms as men, that is, if there was a transition to a more gender-balanced occupation structure in EU countries, the GDP would increase by 30 percent. In OECD countries, women participate in a much narrower range of jobs compared to men. On average, 24 occupations comprise half of the employed men, whereas only 12 occupations comprise half of the employed women. Women are under-presented in managerial jobs, as well as in manufacturing and construction jobs. Additionally, again across the OECD, women have a greater tendency to participate in temporary jobs; the gender gap in the share of temporary employment is 34%.[7] However, signs of decreasing occupational segregation can be observed for workers in the age group 25-34 as compared to their older counterparts in OECD countries. The increasing occupational integration among gender is more pronounced for more highly educated workers, whereas less well-educated women and men choose more gender-typed jobs. This explains why the better educated younger generations are more occupationally integrated than their older counterparts.[8]

The aim of this work is to determine whether the increase in the share of females in labor stock has any positive effect on GDP per adult/capita/worker convergence in OECD countries. There is a limited literature regarding the gender impact in employment on economic growth. Elson (1995) states that the

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female labor force brings in the reduction of the share of wages, therefore the change in income distribution.

[6] There may be several channels for this. For example, Erturk and Cagatay (1995) argues that the feminization of the labor force promotes investments due to the lower unit labor costs, and the high-income, and the high-middle income countries benefit more from the feminization of labor force. In a similar fashion, Seguino (2000) argues that the income growth is positively related to gender wage inequality in semi-industrialized export-oriented economies; and the part of this positive effect is through the positive effect of gender wage inequality on investment as a share of GDP.

[7] OECD (2011).

[8] OECD (2002).

gender inequality in short run can cause higher profits, whereas in the long run, it damages sustainable development. Blecker and Seguino (2002) and Seguino (2000) contribute to the literature in terms of female labor force participation and economic growth. Seguino (2000) concludes that high female labor force participation rates increase economic growth for a set of semi-industrialized countries. Berta-Esteve Volart (2004) investigates the relationship between gender discrimination and economic growth with the panel data for the Indian states and finds that the gender discrimination in labor market causes a reduction in GDP per capita and therefore lowers the economic growth. Tzannatos (1999) compares the inequality in gender in terms of employment among developing countries and industrialized countries and concludes that the gender discrepancies in employment are getting narrow faster in developing countries than it did in industrialized countries. This paper also states that the gender inequality in employment and education has adverse effects on economic development. In a study on gender equality, economic growth, and employment in EU countries, Löfström (2009) concludes that despite the direct relationship among the per capita income growth and female employment, the evidence does not support the long term gender equality in employment and therefore sustainable economic development. None of these studies however analyze the convergence effects of gender.

Other studies that may be considered (indirectly) relevant with this study include those that find that gender inequality in education and employment have negative impacts on economic growth, such as Galor and Weil (1996), Abu-Ghaida and Klasen (2004), Klasen (2006).[9] Galor and Weil (1996) state that the female education may affect economic growth directly, since it increases the education of the next generation and lowers the fertility. Klasen et al. (2008) conclude that gender inequality in education and gender discrimination in labor force in MENA countries have a considerable negative impact on economic growth. Some other studies consider that the increase in female education brings an increase in female employment and the decrease in fertility rates. Goldin (1990) claims that the supply of female employees is increased by rising levels of education and delayed marriage and lower fertility rates. Petit and Hook (2005) investigates the demographical and structural effects on female employment and finds a considerable relationship. Lehrer and Nerlove (1986) attends to the relationship between the fertility rate and the female labor force participation for the USA and finds this relationship is changeable over time and depends on social factors such as education level, the convenience of employment. Using a panel data for OECD countries for the period 1970-1995, Ahn and Mira (2002) show a significant and negative

[9] In contrast, Barro and Lee (1994) point to the positive effects that the inequality in education can have on economic development.

correlation between fertility rate and female employment as expected until the early 1980's, after which a positive correlation is found. Marital status and child-rearing responsibilities can also be considered as a social barrier on the employment of females. Maglad (1998) finds a negative impact of child-rearing responsibilities on female labor force participation.

In light of these studies, we perform a theoretical and empirical study regarding the impact of gender convergence on economic growth among OECD countries, that is, on the well-known concept of economic convergence. To our knowledge, this is the first study of its kind. The 'convergence' hypothesis has been one of the focus points of the empirical growth literature for many years. Early works in this direction were Abramovitz (1986), Baumol (1986), De Long (1988), Barro (1991), Barro and Sala-i Martin (1992), and Mankiw, Romer and Weil (1992).[10] These studies performed cross-section regression to test the convergence effect, that is, whether less developed countries tend to grow at a faster rate than more developed countries. With Barro (1991) and MRW (1992), the classical Solow- Swan model is augmented by adding human capital to the model. An enormous body of research has been done in this field after the initial studies discussed above. The cross section regression analyses are broadened by different approaches. Knight et al. (1993), Loayza (1994), Islam (1995), Caselli et al. (1996), Nerlove (1996), Lee et al. (1997) perform a panel data approach to increase the robustness of tests. All the studies mentioned employ the per adult/ per capita/ per worker income growth as a dependent variable of initial income level and the different control variables such as physical capital, human capital, public/ private investments in order to test the effect of convergence on income growth, and find different convergence rates due to differences in the methods used, the periods, and the countries included.[11]

The empirical part of this study is based on the panel data analysis in order to preserve the 'unbalanced' feature of the data. The 5-year span panel data test the theoretical work empirically for 34 OECD countries, for the period 1951-2010. The effect of the female share in employment on the growth of GDP per adult/ per capita/ per worker is tested in addition to the standard determinants

[10] Henceforth, MRW (1992).
[11] On the other hand, Bernard and Durlauf (1995), Bernard and Durlauf (1996), Evans and Karras (1996) employ pure time-series approach by defining convergence as deterministic/ stochastic long run trend identical to the countries. They treat log per-capita output as an integrated variable. Evans and Karras (1996) tests for variation in output for the states of country and their results support the convergence hypothesis; however, Bernard and Durlauf (1995) apply multivariate tests for convergence and cointegration for OECD countries and reject the convergence. Bernard and Durlauf (1996) compare the cross section tests and time series tests and conclude the time series tests are more associated with convergence than the cross-section tests.

of growth; the saving rate, the level of GDP per adult/ per capita/ per worker of the previous period, and the population growth rate augmented by the sum of rates of effective depreciation and exogenous technological progress (population growth rate augmented by a constant). The positive and significant effect of the saving rate and the negative and significant effect of the GDP per adult/ per capita/ per worker of the previous period is found on GDP per adult/per capita/per worker growth, as expected. We also find that the female share in employment has positive and significant effect on income per adult/ per capita growth. The tertiary school enrollment rate as a control variable has no significant effect. Our analysis also supports the ‘S-shaped’ Kuznets Curve of Gender hypothesis. The S-shaped Kuznets Curve of Gender hypothesis argues that there are three phases in the relationship between economic development and gender equality: “In the first phase, economic development should improve gender equality; in the second phase, equality should plateau or even decline slightly; and in the third phase, it should rise again” (Eastin and Prakash, 2013). We find that rising gender equality (in terms of rising share of female workers) contributes first negatively but then positively to economic growth in OECD countries in the period 1951-2010. We conjecture that our results for OECD correspond to the second and third phases of S-shaped Kuznets Curve of Gender hypothesis. The organization of the paper is as follows. Section 2 develops a gender-augmented convergence equation. Section 3 is reserved for the empirical test of the convergence equation. Section 4 concludes the paper.

The Model

Suppose that production function is defined as

$$Y = K^{\alpha} \cdot (A \cdot L_M)^{\beta} \cdot (A \cdot L_F)^{1-\alpha-\beta} \quad (1)$$

In (1), K is physical capital, L_M is male labor force, L_F is female labor force, A is the overall technological progress, defined $A = A_0 \cdot e^{xt}$, and x is the exogenous rate of technological progress. Parameters α, β, and $1-\alpha-\beta$ represent production elasticities of capital, male labor and female labor. We presume that $L_M + L_F = L$. Expressing production function in effective per capita terms, $A \cdot L$, we get

$$\tilde{y} = \tilde{k}^{\alpha} \cdot (\theta_M)^{\beta} \cdot (\theta_F)^{1-\alpha-\beta} \quad (2)$$

In (2), $\tilde{y} = \frac{Y}{AL}$, $\tilde{k} = \frac{K}{AL}$, and $\theta_M = \frac{L_M}{L}$ is the share of male and $\theta_F = \frac{L_F}{L}$ is the share of female labor force in total labor stock. We assume that male and female labor forces grow at the same rate, n, which implies that total labor force growing at that particular rate, as well. Hence, θ_M and θ_F are constant. In a Solow framework, the fundamental equation of growth in effective per capita would then be

$$\dot{\tilde{k}} = s \cdot \tilde{k}^{\alpha} \cdot (\theta_M)^{\beta} \cdot (\theta_F)^{1-\alpha-\beta} - (n + \delta + x) \cdot \tilde{k} \qquad (3)$$

where a dot on top of a variable indicates time derivative of a variable, namely, $\dot{\tilde{k}} = \frac{d\tilde{k}}{dt}$. The steady state value of effective capital per capita is then

$$\tilde{k}_{ss} = \left(\frac{s}{n+\delta+x}\right)^{\frac{1}{1-\alpha}} \cdot (\theta_M)^{\frac{\beta}{1-\alpha}} \cdot (\theta_F)^{\frac{1-\alpha-\beta}{1-\alpha}} \qquad (4)$$

This then implies that $\tilde{y}_{ss} = \left(\frac{s}{n+\delta+x}\right)^{\frac{\alpha}{1-\alpha}} \cdot (\theta_M)^{\frac{\beta}{1-\alpha}} \cdot (\theta_F)^{\frac{1-\alpha-\beta}{1-\alpha}}$. Notably, long-run equilibrium value of GDP per effective capita implies an 'optimal' share of female labor, à la the optimal tax rate in Barro (1990).

Next, let us look at the convergence implications of gender. For that purpose, let us first take log differentiation of production function (in per capita), which yields $\hat{\tilde{y}} = \alpha \cdot \hat{\tilde{k}}$, where $\hat{\tilde{y}} = \frac{\dot{\tilde{y}}}{\tilde{y}}$ and $\hat{\tilde{k}} = \frac{\dot{\tilde{k}}}{\tilde{k}}$ (recall that θ_M and θ_F are constant). Then, we may express fundamental equation of growth in terms of $\tilde{y}$. First, we divide equation (3) by $\tilde{k}$ and next replace it by its $\hat{\tilde{y}}$ equivalent, $\tilde{k} = \tilde{y}^{\frac{1}{\alpha}} \cdot (\theta_M)^{-\frac{\beta}{\alpha}} \cdot (\theta_F)^{-\frac{1-\alpha-\beta}{\alpha}}$, and get

$$\frac{dLn[\tilde{y}]}{dt} = \alpha \cdot \left[s \cdot e^{\left(\frac{\alpha-1}{\alpha}\right)Ln[\tilde{y}]} \cdot (\theta_M)^{\frac{\beta}{\alpha}} \cdot (\theta_F)^{\frac{1-\alpha-\beta}{\alpha}} - (n + \delta + x)\right] \equiv \phi(Ln[\tilde{y}]) \qquad (5)$$

In (5), $\phi(Ln[\tilde{y}])$ underlines the fact that the right hand side of (5) is function of $Ln[\tilde{y}]$. Through Taylor expansion, one may easily log-linearize (5):

$$\frac{dLn[\tilde{y}]}{dt} \approx \phi(Ln[\tilde{y}_{ss}]) + \phi'(Ln[\tilde{y}_{ss}])\big[Ln[\tilde{y}] - Ln[\tilde{y}_{ss}]\big]$$

where $\phi(Ln[\tilde{y}_{ss}])$, which is equal to zero, is steady-state value of $\phi(\cdot)$ and $\phi'(Ln[\tilde{y}_{ss}])$ is the derivative of $\phi(\cdot)$ evaluated at steady state. Through the standard convergence algebra, it is easy to arrive at the following:

$$Ln[y(t_2)] - Ln[y(t_1)] = -(1 - e^{-\nu\cdot\tau}) \cdot Ln[y(t_1)] + (1 - e^{-\nu\cdot\tau}) \cdot \frac{\alpha}{1-\alpha} \cdot Ln[s] - (1 - e^{-\nu\cdot\tau}) \cdot \frac{\alpha}{1-\alpha} \cdot Ln[n + \delta + x] + (1 - e^{-\nu\cdot\tau}) \frac{\beta}{1-\alpha} \cdot Ln[\theta_M] + (1 - e^{-\nu\cdot\tau}) \cdot \frac{1-\alpha-\beta}{1-\alpha} Ln[\theta_F] + (1 - e^{-\nu\cdot\tau}) \cdot Ln[A_0] + x(t_2 - e^{-\nu\cdot\tau} t_1) \quad (6)$$

In (6), y is income per capita, $\nu = (1 - \alpha) \cdot (n + \delta + x)$, $-\nu$ is the convergence rate, t_2 and t_1, $t_2 > t_1$, are two points in time and $\tau = t_2 - t_1$. We will essentially employ (6) in the empirical part of our convergence analysis.

Data, Methodology and Findings

3.1 Data and Methodology

This study is for 34 OECD countries and covers the period 1951-2010. The dependent variable is the growth of GDP per adult/capita/worker and the data are obtained from Heston et al. (2012) dataset. The investment share of GDP per capita (s) is also taken from Heston et al. (2012) dataset, in a percentage form. As we test not only GDP per capita but also GDP per worker, the growth rate of workers is acquired from The Conference Board of Total Economy Database.[12] The population growth rates of countries are derived from Heston et al. (2012) dataset. The sum of the technology growth rate and the depreciation rate ($x + \delta$) is assumed to be time and country invariant variable and is regarded as 5% for all countries, following MRW (1992). The female share (θ_F) is obtained from OECD Stats and the ILO (International Labor Organization) Database. The employed females are assumed to be in the age range of 15-64.The data for the tertiary school enrollment rate of females (T_F) are from Barro and Lee (2010) Dataset of Educational Attainment. Following Islam (1995), five year averages are calculated, and therefore 12 data (time) points for 34 countries are obtained, e.g., 1955, 1960... 2010.

3.2 Findings

Equation (6) measures the contribution of men and women labor force and their respective productivities on economic growth during convergence. We will run the following equation for measuring convergence:

[12]http://www.conference-board.org/data/economydatabase/.

$$Ln[y_{i,t}] - Ln[y_{i,t-1}] = \gamma_0 - \gamma_1 \cdot Ln[y_{i,t-1}] + \gamma_2 \cdot Ln[s_{i,t}] - \gamma_3 \cdot Ln[n_{i,t} + \delta + x] + \gamma_4 \cdot Ln[\theta_{Fi,t}] + Z_t + \epsilon_{i,t} \qquad (7)$$

where $\gamma_0 = (1 - e^{-\nu \cdot \tau}) \cdot Ln[A_0] + x(t_2 - e^{-\nu \cdot \tau} t_1)$ is a constant, $\gamma_1 = (1 - e^{-\nu \cdot \tau})$, $\gamma_2 = \frac{\alpha}{1-\alpha} \cdot (1 - e^{-\nu \cdot \tau})$, and $\gamma_4 = \frac{1-\alpha-\beta}{1-\alpha} \cdot (1 - e^{-\nu \cdot \tau})$. Notably, we dropped the share of male workers from our econometric equation, as $\theta_F + \theta_M = 1$ creates collinearity problem. The LHS of (7), $\mathrm{Ln}[y_{i,t}] - \mathrm{Ln}[y_{i,t-1}]$, is the average growth rate of income per adult/ per capita/ per worker in 5-year span. Determinants of convergence in level of per adult/ per capita/ per worker take place on the RHS. γ_1 is the coefficient of previous 5-year span income per adult/ per capita/ per worker, $\mathrm{Ln}[y_{i,t-1}]$. Notably, this coefficient is theoretically expected to be negative, which would be consistent with the convergence idea. Coefficient γ_2 shows the contribution of investment rate, $\mathrm{Ln}[s_{i,t}]$, and γ_3 measures the impact of growth rate of adults/ population/ workers, augmented by technology and depreciation, $\mathrm{Ln}[n_{i,t} + \delta + x]$. γ_4 measures contribution of share of female labor force, $\mathrm{Ln}[\theta_{Fi,t}]$, on convergence, which is expected to be positive. In (7), Z is vector of control variables. In our empirical analysis, we will only use the tertiary enrollment rate of females, $\mathrm{Ln}[T_{Fi,t}]$, as control variable, due to data limitations in other possible control variables. Finally, $\epsilon_{i,t}$ is the error term and the subscripts $\mathbf{t}$ and $\mathbf{i}$ denote the time period index and the country index, respectively.

Table 1: Panel Regression of 5-year span data, test of convergence

Dependent Variable: log difference of GDP per adult/per capita/per worker									
	Per adult			Per capita			Per worker		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Constant	0.2330 (1.26)	0.0178 (0.03)	0.3380 (0.52)	0.2480 (1.39)	0.0152 (0.03)	0.2636 (0.42)	0.6941*** (8.12)	0.8117*** (3.97)	1.4014*** (3.10)
$\ln[y_{i,t-1}]$	-0.0975*** (6.86)	-0.1564*** (9.22)	-0.1850*** (4.36)	-0.0923*** (6.58)	-0.1567*** (9.98)	-0.1797*** (4.36)	-0.1511*** (13.44)	-0.1493*** (7.32)	-0.1899*** (4.57)
$\ln[s_{i,t}]$	0.2412*** (5.83)	0.2734*** (4.54)	0.2771*** (4.52)	0.2443*** (5.94)	0.2773*** (4.49)	0.2808*** (4.41)	0.2604*** (9.56)	0.1927*** (4.06)	0.1985*** (4.15)
$\ln[n_{i,t} + \delta + x]$	0.0493 (0.78)	0.0909 (0.68)	0.0995 (0.78)	0.0026 (0.04)	0.0446 (0.33)	0.0513 (0.40)	0.1047*** (4.73)	0.1199*** (4.79)	0.1178*** (4.84)
$\ln[\theta_{Fi,t}]$	-	0.1728** (2.20)	0.1474* (1.79)	-	0.1897*** (2.38)	0.1701** (2.02)	-	0.0158 (0.26)	-0.0431 (0.74)
$\ln[T_{Fi,t}]$	-	-	0.0176 (0.90)	-	-	0.0146 (0.72)	-	-	0.0251 (1.13)
Hausman- Test	***	***	***	***	***	***	***	***	***
Adjusted R^2	0.44	0.50	0.50	0.43	0.51	0.51	0.60	0.60	0.61
Implied ν	0.0085	0.0141	0.0170	0.0080	0.0142	0.0165	0.0136	0.0134	0.0175
Number of Observations	330	236	236	330	236	236	322	234	234
Periods/Cross Sections Included	11/34	11/34	11/34	11/34	11/34	11/34	11/34	11/34	11/34

Note: All variables are consistent with the dependent variable.

Note: ***, ** and * indicate that the coefficient is significant at 1%, 5% and 10%, respectively. '–'denotes that variable does not take place in the regression. t-statistics are given in parenthesis. Implied convergence rate calculation presumes t=12.

The 9 columns of Table 1 illustrate the convergence results of 34 OECD countries for the period 1951-2010 in a panel form in terms of per adult, per capita, and in per worker terms respectively. Regressions in columns (1) only embody the following as independent variables: GDP per adult/ per capita/ per worker of the previous period, the saving rate and the population growth rate augmented by depreciation rate and exogenous technological progress (effective depreciation). Those in columns (2) also include the share of female in employment, and those in columns (3) considers the tertiary school enrollment rate of females as a control variable, in addition to the share of female in employment. All runs assume fixed cross-section effects since the Hausman-test is rejected at 1 percentage level for all regressions.

In all regressions, the convergence variable is negative and the saving rate is positive, as expected from the theory, and statistically significant at 1 percentage level. When GDP per adult data is used, the share of females in employment is positive and significant at 5 percentage level with no control variable; whereas it is significant at 10 percentage level when the tertiary school enrollment rate of female is added. When GDP per capita is used, the female share in employment is positive and statistically significant at 1 percentage level and at 5 percentage level when tertiary school enrollment rate is used as control variable. In per worker terms, the female share in employment is positive but insignificant, irrespective of whether control variable is considered. In all 9 regressions, the tertiary school enrollment rate of female is positive but statistically insignificant. The implied convergence rate is between 0.8-1.8 percentage points.

3.3 The Curvilinear Impact of Gender Equality on Economic Growth

There has been extensive discussion of the Kuznets Curve of Gender, that is, the tendency of gender inequality to first increase with the rises in income, but then to die out as income continues to increase. For example, Lancitan et al. (1996) test the impact of economic growth on gender inequality with time-series data for a set of Asian countries, and the results support for Kuznets's theory in gender inequality that income growth leads to an eventual decrease in gender inequality in the long-run. Similarly, Pampel and Tanaka (1986) finds a curvilinear relationship between data for female labor force participation and the economic growth for 70 nations, concluding that at the initial levels, development forces females out of the labor force, but at more advanced levels, increasing development causes an expansion of female labor force participation, and decreases gender inequality. Forsythe (2000) also observes a curvilinear relationship between gender inequality and income growth for all countries, with both longitudinal and cross-sectional analyses for the years 1970 and 1992. In this subsection, we will repeat the exercise by taking into consideration the Kuznets Curve of Gender hypothesis.

Table 2: Panel Regression of 5-year span data, test of Kuznets Curve of Gender

Dependent Variable: log difference of GDP per adult/per capita/per worker			
	Per adult	Per capita	Per worker
Constant	2.8909** (2.13)	1.7979 (1.32)	10.4147*** (5.01)

$Ln[y_{i,t-1}]$	-0.1641*** (9.28)	-0.1615*** (9.70)	-0.1651*** (7.88)
$Ln[s_{i,t}]$	0.2760*** (4.45)	0.2790*** (4.42)	0.1880*** (4.05)
$Ln[n_{i,t}+\delta+x]$	0.0724 (0.55)	0.0330 (0.25)	0.1307*** (5.98)
$Ln[\theta_{Fi,t}]$	-1.3882* (1.79)	-0.7801 (1.01)	-5.2715*** (4.72)
$Ln[\theta_{Fi,t}]^2$	0.2190** (1.98)	0.1361 (1.24)	0.7383*** (4.66)
Hausman- Test	***	***	***
Adjusted R^2	0.50	0.51	0.64
Implied v	0.0149	0.0146	0.0156
Number of Observations	236	236	234
Periods/Cross Sections Included	11/34	11/34	11/34

Note: All variables are consistent with the dependent variable.
Note: ***, ** and * indicate that the coefficient is significant at 1%, 5% and 10%, respectively. t-statistics are given in parenthesis. Implied convergence rate calculation presumes t=12.

As seen in Table 2, the square of female share in employment is significant at 5 and 1 percentage levels, when GDP per adult and GDP per worker are used respectively. The negative signs of female shares in employment and the positive signs of the square of female shares in employment in both regressions indicate that there is a curvilinear relationship between female labor force participation and the economic growth for OECD countries: while gender equality is low (high) and increasing, its contribution to economic growth is negative (positive). We speculate that this result coincides with the second and third phases of S-shaped Kuznets Curve of Gender, à la Eastin and Prakash (2013).[13]

Concluding Remarks

This paper studies the effect of gender on income convergence. At first, the paper derives a convergence equation in which the role of gender on economic growth is taken into account. Next, the gender-augmented convergence equation is run using 5-year span panel data of OECD countries for the period 1951-2010. We find that the share of female workers has positive and significant impact on GDP per adult and GDP per capita growth. We also show that the convergence speed of OECD countries is between 0.8-1.8 percentage points and consistent with the literature. Finally, we show that the impact of gender equality on economic growth supports the Kuznets Curve of Gender for OECD countries.

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[13] When the cubic form of gender equality is added to the test, all gender coefficients become statistically insignificant, with the correct signs for inverted S-shape. As the dependent variable is first-differenced GDP rather than level GDP, this is expectable.

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