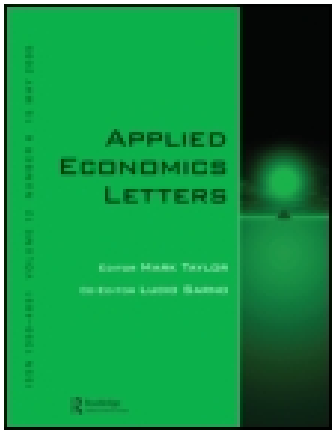

Applied Economics Letters
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/rael20

Women's labour force participation and pay inequality: evidence from panel cointegration

Adem Y. Elveren[a]
[a] Department of Economics, Keene State College, Keene, NH 03435, USA
Published online: 02 Apr 2014.

To cite this article: Adem Y. Elveren (2014) Women's labour force participation and pay inequality: evidence from panel cointegration, Applied Economics Letters, 21:12, 862-865, DOI: 10.1080/13504851.2014.894622

To link to this article: http://dx.doi.org/10.1080/13504851.2014.894622

Applied Economics Letters, 2014
Vol. 21, No. 12, 862–865, http://dx.doi.org/10.1080/13504851.2014.894622

Routledge
Taylor & Francis Group

Women's labour force participation and pay inequality: evidence from panel cointegration

Adem Y. Elveren

Department of Economics, Keene State College, Keene, NH 03435, USA
E-mail: ademyavuzelveren@gmail.com

This article examines the relationship between women's labour force participation and pay inequality for 58 countries for the 1990–2005 period using a panel cointegration analysis. The findings show that while higher women's labour force participation increases pay inequality in developing countries, it leads to a reduction in developed countries.

Keywords: women's employment; gender; inequality; growth

JEL Classification: C23; J21; O15

I. Introduction

Feminist economists have suggested two integrated hypotheses to explain the gender wage gap, namely the 'crowding' and the 'discrimination' hypotheses (Bergmann, 1974; Treiman and Hartmann, 1981). Accordingly, there exists gender segregation of employment that causes an oversupply in the women's labour force (i.e. crowding) due to a limited number of available jobs. This, in turn, creates a gender wage gap along with the existing wage discrimination against women. It is argued that economic development has resulted in women's higher labour force participation; however, women mostly have been involved in lower-paid secondary positions – with no mobility towards higher-paid, skilled jobs or to supervisory positions – due to patriarchal norms embedded in cultural, political, legal and economic institutions (Seguino, 1997; Berik *et al.*, 2009). It is evident that there has been improvement in the female/male wage ratio (Berik, 2000; Weichselbaumer and Winter-Ebmer, 2005). However, despite the improvement the gap is still remarkable and varies considerably between countries. For example, while the female/male ratio was 0.927 in Austria, it was as low as 0.644 in Germany in 2005 (Wolszczak-Derlacz, 2013).

An increase in women's participation in the labour market can have different effects on general pay inequality. First, due to the crowding hypothesis it is expected that the higher number of women seeking jobs will lead to a decline in average wage levels for women, yielding higher pay inequality. Also, it is expected that with increasing competition, 'social dumping' is likely to hurt women disproportionately as they have lower bargaining power than men do. Second, a higher number of women workers, in the sense of the reserve army of the unemployed, can create downward pressure on men's wages, improving pay inequality by equalizing wages downward. It is, however, plausible to assume in the case of the crowding hypothesis due to job segregation between males and females that this effect might not work. This might be valid to a certain degree in developed countries. Finally, the skill level of female workers has a direct effect on pay inequality. Higher economic growth leads to better infrastructure and to an increase in the quality of public works that is extended for more people. This, in turn, means a more educated labour force that causes the skill premium to decrease, improving pay inequality (World Bank, 2001). Therefore, the final outcome of higher women's labour force participation on pay inequality is ambiguous.

It is plausible to expect differing effects for developed and developing countries.

Based on the above discussion, this study examines the crowding hypothesis for a set of 25 developed and 33 developing countries for the period of 1990–2005.

II. Methodology and Data

Since it is plausible to assume that economic development has an effect on both women's labour force participation and inequality, GDP (and GDP per capita as an alternative) is also incorporated to control for nonstationary omitted variables.

$$inequality_{it} = a_i + \delta_{it} + \beta_{1i}\log(income_{it}) + \beta_{2i}labourforce_{it} + \varepsilon_{it} \quad (1)$$

where a_i are country-specific fixed effects and δ_{it} country-specific time trends. They account for any country-specific omitted factors.

The dependent variable, *inequality*, is the 'Estimated Household Income Inequality' index provided by the University of Texas Inequality Project. The *income* variables are GDP at constant US$2000 and real GDP per capita. All the variables, including women's labour force participation rate, are taken from the World Bank. A lack of data leads a balanced panel data for only the 1990–2005 period for 58 countries.

III. Results and Discussion

To test the stationarity the main panel unit root tests are employed.

Table 1 reports that while three of the tests lead one to accept the existence of unit root at levels for all variables, all tests – except for LLC (Levin–Li–Chu) for labour force – suggest that the first difference series of all variables are stationary. That is, the results suggest that variables are integrated of order 1, allowing one to pursue cointegration analysis.

To investigate the existence of cointegration two main panel cointegration tests suggested by Pedroni (1999, 2004) and Kao (1999) are utilized. Table 2 presents the results of panel cointegration tests for the model specification with log(GDP). To note, the results are substantially similar to the case of log (GDP per capita). All tests reject the null hypothesis of no cointegration at the 1% level, concluding that there exists a long-run relationship between real GDP (and GDP per capita as well), inequality and women's labour force participation.

The long-run relationship between the variables are analysed with the standard dynamic ordinary least

Table 2. Panel cointegration tests with log(GDP)

	Full	Developed	Developing
Pedroni			
Panel PP *t*-statistic	−5.1962***	−5.8322***	−2.8699***
Panel ADF *t*-statistic	−5.5426***	−7.3102***	−4.4714***
Group PP *t*-statistic	−10.5372***	−8.3388***	−6.7116***
Group ADF *t*-statistic	−10.5070***	−6.9529***	−7.7787***
Kao	−3.8236***	−1.2821*	−3.2519***

Notes: The number of lags is determined by the Schwarz Info Criterion with a maximum number of two lags. Pedroni test with deterministic intercept and trend. * and *** refer to significance at the 10% and 1% levels, respectively.

Table 1. Panel unit root tests

Variables	Deterministic terms	LLC	IPS	MW	Choi
Levels					
Labourforce	Intercept, trend	0.8678	−0.2411	118.504	155.389
		(0.8073)	(0.4047)	(0.4179)	(0.0086)
Inequality	Intercept, trend	1.0894	−0.6984	114.532	221.418
		(0.8620)	(0.2425)	(0.5211)	(0.0000)
log(GDP)	Intercept, trend	2.2025	−0.6440	113.192	193.520
		(0.9862)	(0.2598)	(0.5565)	(0.0000)
log(GDPcapita)	Intercept, trend	2.5270	−0.0679	101.608	191.512
		(0.9942)	(0.4729)	(0.8271)	(0.0000)
First Differences					
Δ*labourforce*	Intercept	0.5969	−4.0868	170. 629	509.242
		(0.7247)	(0.0000)	(0.0007)	(0.0000)
Δ*inequality*	Intercept	−2.1630	−6.0173	212.412	616.453
		(0.0153)	(0.0000)	(0.0000)	(0.0000)
Δlog(GDP)	Intercept	−4.6802	−6.0384	204.1923	434.025
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
Δlog(GDPcapita)	Intercept	−3.5509	−5.5001	192.8068	444.4444
		(0.0002)	(0.0000)	(0.0000)	(0.0000)

Notes: The number of lags is determined as two, which is the maximum of optimum lags for individual series. *p*-Values are in parentheses.

square (DOLS) method and its Mark and Sul (1999) extensions, in which estimation accounts for heterogeneity, weighting the data using cross-section specific.

$$Inequality_{it} = a_i + \delta_{it} + \beta_{1i}\log(income_{it}) + \beta_{2i} labourforce_{it} + \sum_{j=-k_i}^{k_i} \phi_{1ij}\Delta\log(income_{it-j}) + \sum_{j=-k_i}^{k_i} \phi_{2ij}\Delta labourforce_{it-j} + \varepsilon_{it} \quad (2)$$

where Φ_{1ij} and Φ_{2ij} are coefficients of lead and lag differences that account for possible serial correlation and endogeneity of the regressors.

Table 3 reports for the full set that the effect of economic development on pay inequality is highly significant, regardless of income type. Results on labour force, on the other hand, point out the heterogonous structure of the full set, as it is found having highly insignificant counter signs. In fact, labour force has the counter signs for developed and developing countries, consistent with both respect to estimation method and income variable used. Although the estimation results of the standard method for developing countries are not significant, the sign of the coefficient is consistent with the rest of the analysis.

The finding that regardless of the set of countries (i.e. developed or developing) used, rising national income causes higher pay inequality is a further input for a large body of literature that yields inconclusive results (inter alia Barro, 2008).

Regarding women's labour force participation – while it has a positive (i.e. worsening) effect on pay inequality in developing countries, it has an improving effect on pay equality in developed countries. This result is consistent with the fact that the occupational gender wage inequality gap decreases as GDP per capita increases (Oostendorp, 2009). That is, the gender gap in educational attainment has narrowed with development, reducing the wage skill premium between men and women. This, in turn, improves the general pay inequality situation. Regarding developing countries, on the other hand, the findings support the crowding hypothesis.

Finally, in order to understand the direction of causality between variables we employed a noncausality test for heterogeneous balanced panel data suggested by Dumitrescu and Hurlin (D-H) (2012) in following form:

$$\Delta LABOURFORCE_{i,t} = \alpha_i + \sum_{k=1}^{p} \gamma_i^k \Delta LABOURFORCE_{i,t-k} + \sum_{k=1}^{p} \beta_i^k \Delta INEQUALITY_{i,t-k} + v_{i,t} \quad (3)$$

$$\Delta INEQUALITY_{i,t} = \alpha_i + \sum_{k=1}^{p} \gamma_i^k \Delta INEQUALITY_{i,t-k} + \sum_{k=1}^{p} \beta_i^k \Delta LABOURFORCE_{i,t-k} + v_{i,t} \quad (4)$$

where, α_i are assumed be fixed in the time dimension. The D-H test is the average of the test statistics of standard Granger Causality regressions for each cross-section individually. The test is applied for each pair of variables. The results suggest that for developed countries while there exist weak causality running from inequality to both GDP

Table 3. DOLS estimations

	Full		Developed		Developing	
	Standard	Weighted	Standard	Weighted	Standard	Weighted
Model 1						
Labour force	−0.004	−0.024	−0.232***	−0.237***	0.013	0.0347*
	(–0.135)	(–1.436)	(2.597)	(–6.049)	(0.316)	(1.802)
Log(GDP)	2.271***	2.937***	3.443***	5.882***	1.111	1.908***
	(4.262)	(12.074)	(6.831)	(13.035)	(1.601)	(5.059)
Model 2						
Labour force	0.0002	0.0098	−0.195***	−0.177***	0.023	0.051***
	(0.008)	(0.563)	(–2.956)	(–4.671)	(0.552)	(2.597)
Log(GDP per capita)	3.509***	3.989***	7.332***	6.755***	2.424***	3.443***
	(5.549)	(14.538)	(6.321)	(11.658)	(2.825)	(6.831)

Notes: *t*-Statistics are in parentheses. In estimations one lead and lag is considered. * and *** refer to significance at the 10% and 1% levels, respectively.

and GDP per capita (significant at the 10% level), there is significant (at the 1% level), unidirectional causality from GDP and GDP per capita to women's labour force participation. For developing countries, the only significant causality is running from both GDP and GDP per capita to inequality (at the 1% level).

IV. Conclusion

This study provides evidence on the crowding hypothesis by analysing the effect of women's labour force participation on pay inequality for a set of 25 developed and 33 developing countries using a panel cointegration analysis for the 1990–2005 period. The article shows that while women's labour force participation causes higher pay inequality in developing countries, it has an improving effect on pay inequality in developed countries.

References

Barro, R. J. (2008) Inequality and growth revisited, Asian Development Bank regional economic integration, Working Paper No. 11, Asian Development Bank, Manila.

Bergmann, B. R. (1974) Occupational segregation, wages and profits when employers discriminate by race and sex, *Eastern Economic Journal*, **1**, 103–10.

Berik, G. (2000) Mature export-led growth and gender wage inequality in Taiwan, *Feminist Economics*, **6**, 1–26. doi:10.1080/135457000750020119

Berik, G., Rodgers, Y. M. and Seguino, S. (2009) Feminist economics of inequality, development, and growth, *Feminist Economics*, **15**, 1–33. doi:10.1080/13545700903093524

Dumitrescu, E.-I. and Hurlin, C. (2012) Testing for granger non-causality in heterogeneous panels, *Economic Modelling*, **29**, 1450–60. doi:10.1016/j.econmod.2012.02.014

Kao, C. D. (1999) Spurious regression and residual-based tests for cointegration in panel data, *Journal of Econometrics*, **90**, 1–44. doi:10.1016/S0304-4076(98)00023-2

Mark, N. C. and Sul, D. (1999) A computationally simple cointegration vector estimator for panel data, *mimeo*, Ohio State University manuscript.

Oostendorp, R. H. (2009) Globalization and the gender wage gap, *The World Bank Economic Review*, **23**, 141–61.

Pedroni, P. (1999) Critical values for cointegration tests in heterogeneous panels with multiple regressors, *Oxford Bulletin of Economics and Statistics*, **61**, 653–70. doi:10.1111/1468-0084.61.s1.14

Pedroni, P. (2004) Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis, *Econometric Theory*, **20**, 597–625. doi:10.1017/S0266466604203073

Treiman, D. J. and Hartmann, H. I. (Eds) (1981) *Women, Work, and Wages: Equal Pay for Jobs of Equal Value,* National Academy Press, Washington, DC.

Seguino, S. (1997) Gender wage inequality and export-led growth in South Korea, *Journal of Development Studies*, **34**, 102–32. doi:10.1080/00220389708422513

Weichselbaumer, D. and Winter-Ebmer, R. (2005) A meta-analysis of the international gender wage gap, *Journal of Economic Surveys*, **19**, 479–511. doi:10.1111/j.0950-0804.2005.00256.x

Wolszczak-Derlacz, J. (2013) The impact of gender wage gap on sectoral economic growth: cross-country approach, GUT Faculty of Management and Economics Working Paper Series No. 6.

World Bank (2001) *Engendering Development. Through Gender Equality in Rights, Resources, and Voice: World Bank Policy Research Report*, Oxford University Press, New York.