

**UNEMPLOYMENT AND LABOR FORCE PARTICIPATION: A PANEL COINTEGRATION ANALYSIS FOR EUROPEAN COUNTRIES**

OZERKEK, Yasemin\*

**Abstract**

This paper investigates the long-run relationship between unemployment and labor force participation and analyzes the existence of added/discouraged worker effect, which has potential impact on economic growth and development. Using panel cointegration techniques for a panel of European countries (1983-2009), the empirical results show that this long-term relation exists for only females and there is discouraged worker effect for them. Thus, female unemployment is undercount.

**Keywords:** labor-force participation rate, unemployment rate, discouraged worker effect, panel cointegration, economic development

**JEL Codes:** J20, J60, O15, O52

---

**1. Introduction**

The link between labor force participation and unemployment has long been a key concern in the literature. There is general agreement that unemployment tends to cause workers to leave the labor force (Schwietzer and Smith, 1974). A discouraged worker is one who stopped actively searching for jobs because he does not think he can find work. Discouraged workers are out of the labor force and hence are not taken into account in the calculation of unemployment rate. Since unemployment rate disguises discouraged workers, labor-force participation rate has a central role in giving clues about the employment market and the overall health of the economy.<sup>1</sup>

Murphy and Topel (1997) and Gustavsson and Österholm (2006) mention that discouraged workers, who have withdrawn from labor force for market-driven reasons, can considerably affect the informational value of the unemployment rate as a macroeconomic indicator. The relationship between unemployment and labor-force participation is an important concern in the fields of labor economics and development economics as well. High unemployment rates imply high costs in the economy. In such an environment, labor resources are underutilized and this may lead to adverse effects on growth potentials and development of the countries. "As with unemployment generally, high levels of hidden unemployment result in the underperformance of the economy through lost output and income." (ACOSS, 2003, p.16)<sup>2</sup> Wooden (1996) points out there is significant hidden unemployment and underemployment in Australia. He states, "an important implication of the presence or underemployment and hidden unemployed persons is that sustained growth is unlikely to lead to reductions in the unemployment

---

\* Yasemin Özerkek, PhD, Marmara University, Faculty of Economics, Department of Economics. Goztepe Campus, Kuyubasi, Kadikoy, İstanbul, Turkey. E-mail:yasemin.ozerkek@marmara.edu.tr

<sup>1</sup> As Tansel (2002) point outs, the effect of the unemployment on labor force participation relies on the relative strengths of discouraged worker effect and the added worker effect. If an increase in unemployment rates results in lower labor-force participation rate, this signals the existence of discouraged worker effect.

<sup>2</sup> See ACOSS (2003) for the social costs of hidden unemployment also.

rate of a similar magnitude.” (p.27) Mitchell (2000) finds that hidden unemployment is a significant problem in Australia and in the United States. Mitchell (2000) uses the method developed by Mitchell et.al. (1995) to provide estimates of the net discouraged worker effect for Australia and the United States. He also finds that cyclical behavior in the labor- force participation rates of demographic groups and the level of hidden unemployment in the two countries are comparable. Agbola (2005) show that hidden unemployment is a major problem and adds to the waste of labor resources that accompany persistent output gaps in OECD countries.

Kottis (1990) finds a considerable discouraging effect of unemployment on labor force participation for females in Greece.<sup>3</sup> Using time series data, Österholm (2010), Emerson (2011), and Kakinaka and Miyamoto (2012) find a long-run relationship between unemployment rates and labor-force participation rates in Sweden, in the U.S., and in Japan, respectively.<sup>4</sup> Österholm (2010) and Emerson (2011) find evidence for discouraged worker effect, especially for males. Kakinaka and Miyamoto (2012) find added-worker effect for young males and discouraged-worker effect for middle-aged and old male groups.

The purpose of this paper is to investigate the long run relationship between unemployment and labor force participation and analyzes the existence of added/discouraged worker effect by putting particular emphasis on their potential impact on economic development. The empirical analysis is performed for a panel of European countries using panel cointegration techniques. The results of the analyses show the direction of this relationship, thereby providing information whether there is discouraged worker effect or added worker effect. The analyses are performed for females, males, and the all.

The rest of the paper is organized as follows. Section 2 delineates the data, Section 3 presents the empirical analyses and discussions, and Section 4 concludes the paper.

## 2. Data

The study uses annual data on the variables of unemployment (*un*) and labor-force participation rate (*lfp*) for females and males. The data is obtained from the World Bank. The countries included in the analysis are Belgium, Denmark, Ireland, France, Italy, Luxemburg, Netherlands, Portugal, Sweden, and United Kingdom.<sup>5</sup> The data is balanced panel and covers 1983-2009. The following figures depict total, male, and female unemployment and labor-force participation rates. As is seen, labor-force participation rates are relatively stable compared to unemployment rates for all cases. Female labor-force participation rates (Figure 4) show an increasing trend while female unemployment rates decline. There are no clear trends for males and for the total.

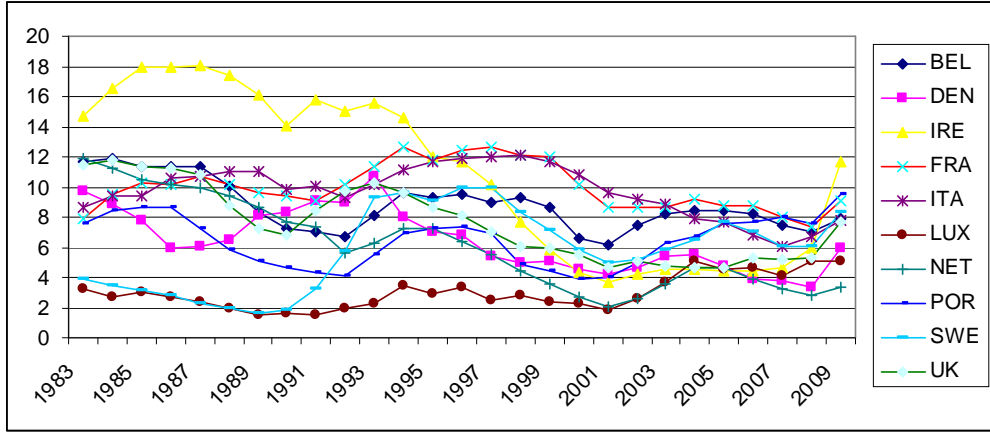
---

<sup>3</sup> See Barth (1968) for the discussion regarding the responsiveness of labor force to changes in the unemployment rate since the late 1930s. Among the other early studies that analyze the labor force participation and unemployment are Mincer (1966) and Cain (1966). See also Mincer (1962) for the female labor force participation.

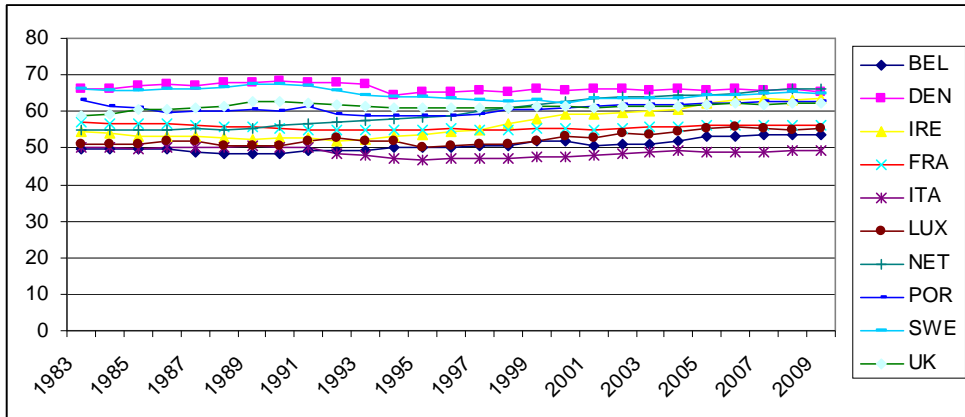
<sup>4</sup> Österholm (2010) and Emerson (2011) mainly analyze the existence of unemployment invariance hypothesis, which suggests that the long-run unemployment rate is independent of the labor force (as well as the size of capital stock and productivity).

<sup>5</sup> The period and countries are chosen based on data availability.

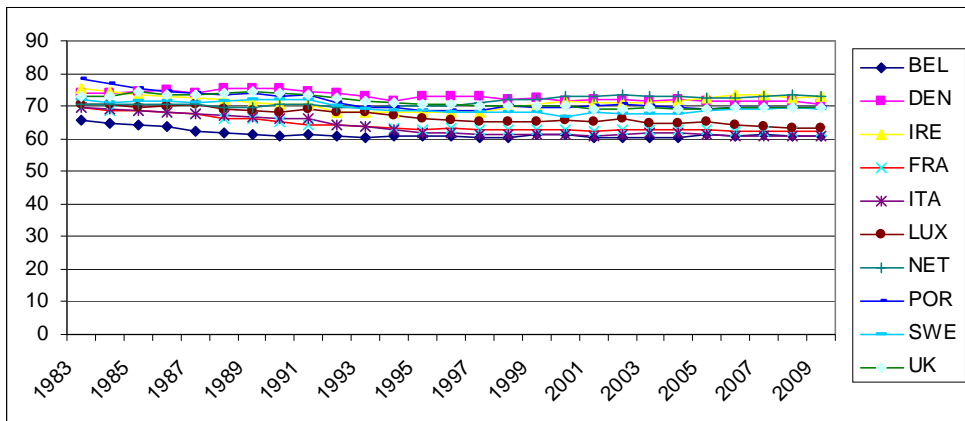
**Figure 1. Total Unemployment**



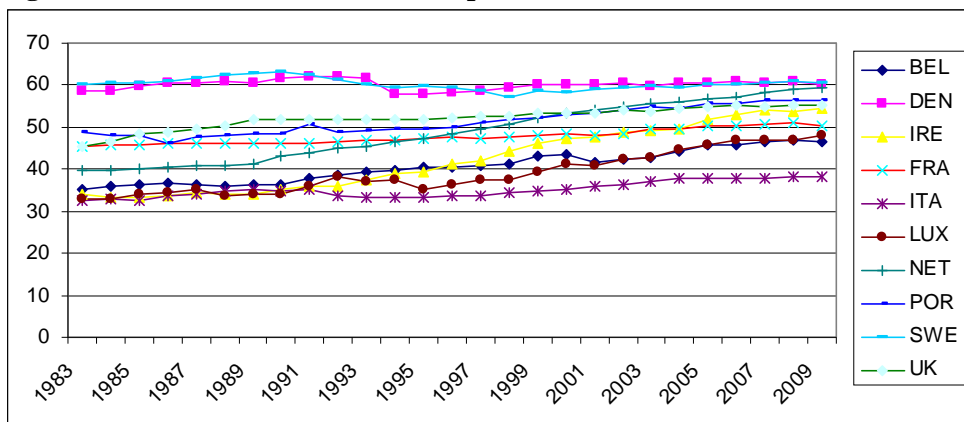
**Figure 2. Total Labor Force Participation**



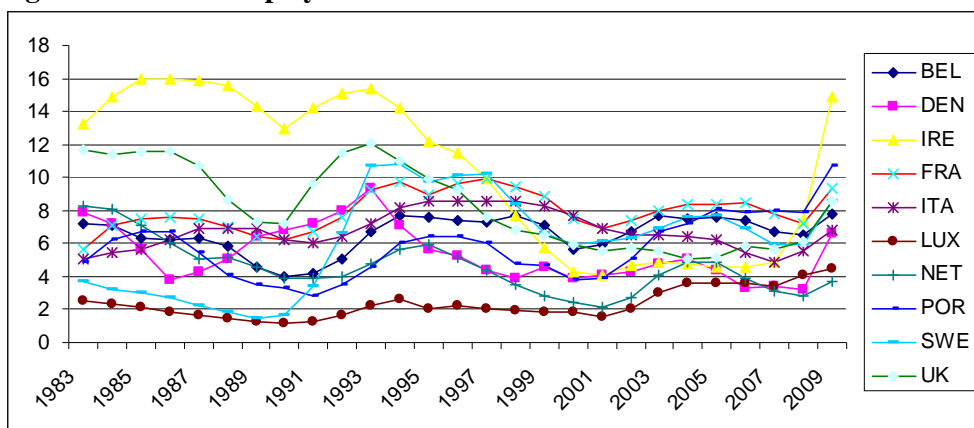
**Figure 3. Male Labor Force Participation Rate**



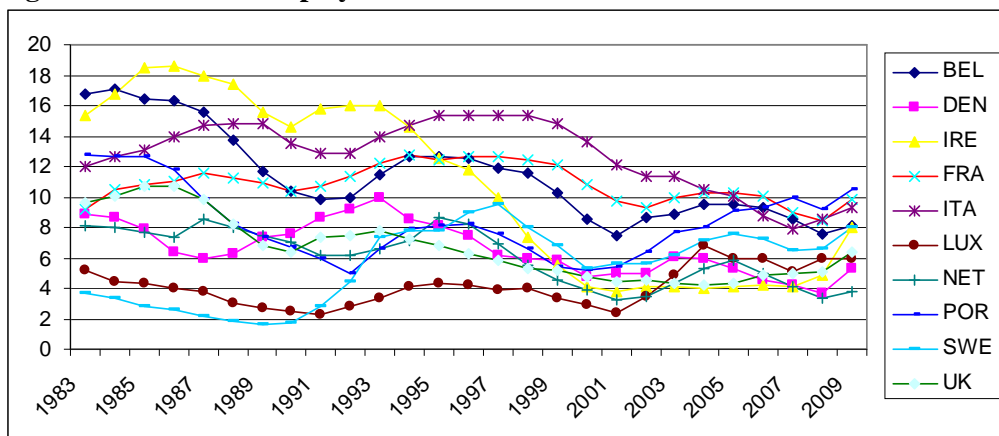
**Figure 4. Female Labor Force Participation Rate**



**Figure 5. Male Unemployment Rate**



**Figure 6. Female Unemployment Rate**



### 3. Empirical Analysis and Discussion

In the analysis, first generation and second generation panel unit root tests are performed in order to detect whether the variables have unit roots. Table 1 reports the findings of the first generation panel unit root test of Levin et al.(2002) (LLC) and second generation panel unit root test of Pesaran (2007) (cross sectionally augmented IPS test (CIPS)). The test of LLC tests the null hypothesis of a common unit root when the cross-sectional units are independent of each other. This test, which is applicable to panels with modest sample size, requires the coefficient of the lagged dependent variable to be homogenous across all units of the panel. However, first generation tests are subject to criticisms. The most important shortcoming of first generation tests is that they all assume that the individual processes are cross-sectionally independent. Therefore, the second-generation panel unit root test of Pesaran CIPS test, which assumes that the individual processes are cross-sectionally dependent, is used in the analysis. Pesaran (2007) shows that CIPS test has satisfactory size and power even for relatively small samples.

**Table 1. Panel Unit Root Tests**

		All		Male		Female	
		un	lfp	un	lfp	un	lfp
LLC	Constant	-1.706*	1.355 (0.912)	-1.332 (0.092)	-5.527*	-0.909 (0.182)	0.753 (0.774)
	Constant and trend	1.210 (0.887)	-0.964 (0.168)	0.908 (0.818)	-0.925 (0.178)	1.249 (0.894)	-0.827 (0.204)
Pesaran CIPS test (p=1)	Constant	-1.638	-1.434	-1.372	-1.897	-1.799	-2.009
	Constant and trend	-1.781	-2.513	-1.811	-2.111	-1.582	-2.843

Notes: The null hypothesis for LLC is unit root. The numbers in brackets are the p-values for the tests. (\*) denotes the rejection of the null of unit root at 5% significance level. For CIPS test, the critical value in the case of a constant is -2.25 and in the case of a constant and trend is -2.94 at 5% significance level.

Both LLC test and Pesaran CIPS test results indicate that *un* and *lfp* have unit root in both constant and constant-and-trend cases in the levels of the variables. Since the variables are non-stationary and have the same integration order, panel cointegration analysis is used. The second-generation panel cointegration test of Westerlund (2007) is employed. The results are presented in Table 2. According to Westerlund (2007) test statistics, the null of no cointegration can be rejected only for females. Hence, it can be inferred that there is evidence for cointegration between labor-force participation rates and unemployment only for females.<sup>6</sup>

<sup>6</sup> Furthermore, Westerlund and Edgerton (2007) test is used to test cointegration. The results of Westerlund and Edgerton (2007) test, which is based on bootstrapping methodology, are in line with Westerlund (2007) test results.

**Table 2. Panel Cointegration Tests**

<b>Westerlund (2007)</b>							
	All		Male		Female		
Test	Constant	Constant & trend	Constant	Constant & trend	Constant	Constant & trend	
$G\tau$	-0.250	1.267	-0.087	4.266*	2.109*	-2.021*	
$G\alpha$	1.232	1.938*	1.534	2.189*	1.473	-2.966*	
$P\tau$	-0.135	1.630	-1.527	4.444*	3.337*	-0.756	
$P\alpha$	0.087	1.298	0.336	3.052*	1.990*	-4.376*	

Notes: The null for Westerlund (2007) is no cointegration. All statistics have -1.645 as 5 % critical value. (\*) denotes significance level at 5%.

After detecting panel cointegration, it is important to obtain coefficient estimates for the variables in question. The fully modified ordinary least squares (FM-OLS) method developed by Pedroni (2000) is used for coefficient estimations in cointegrated panels for females. Labor force participation rate (*lfp*) for females is the variable for normalized cointegrating coefficients. In Table 3, FM-OLS estimates of female unemployment are displayed for 10 emerging market countries individually and for the panel group.

**Table 3. FM-OLS Test**

<b>Dependent variable: Labor force participation rate for females (lfp)</b>				
	Constant		Constant and trend	
<b>Country</b>	<b>Unemployment for females (un)</b>			
Belgium	-0.97* (-8.68)		-0.24* (-6.96)	
Denmark	-0.01* (-6.40)		0.21 (-0.93)	
Ireland	-1.22* (-16.43)		-1.05* (-18.88)	
France	-0.68* (-8.43)		-0.07* (-3.33)	
Italy	-0.53* (-17.17)		0.16* (-3.10)	
Luxemburg	3.05* (2.39)		0.68* (-3.45)	
Netherlands	-1.77* (-15.13)		-1.89* (-12.24)	
Portugal	-0.33* (-2.45)		0.01* (-17.88)	
Sweden	-0.49* (-10.89)		-1.04* (-14.24)	
United Kingdom	-0.91* (-17.41)		-0.73* (-3.54)	
<b>Panel Group</b>	-0.39* (-31.81)		-0.40* (-26.74)	

Notes: The values in the brackets are the t-statistics. (\*) denotes significance at 5 % level.

Except for Luxemburg and Denmark (in the case of constant and trend), all statistics are negative and significant. Unemployment rate has negative effect on labor force participation for females. Panel group estimates of FM-OLS are negative and statistically significant. Therefore, there is a considerable discouraging effect of female unemployment rates on female participation rates.<sup>7</sup> Hence, female unemployment rates are underestimated.

It has been discussed in the literature that economic cycles affect female labor force participation through the added and discouraged worker effects. On the one hand, workers (such as married women) may become discouraged from looking for a job when the unemployment rate is high and withdraw from the labor force. On the other side, economic fluctuations draw women into labor force as husbands become unemployed or under the risk of being unemployed. If discouraged worker effect dominates added worker effect, hidden unemployment emerges.

As unemployment rate increases, there is less chance to find a job. Economic and psychological costs associated with job search are higher when the unemployment rate is high (Tansel, 2002). Because females tend to be more sensitive to these costs, they may be discouraged from searching for a job and remain out of the labor force. Ehrenberg and Smith (2000) suggest that the increasing number of women that become regularly employed and the presence of unemployment insurance benefits bring about the decline in added-worker effect. They also point out that relatively strong substitution effect for especially married women gives rise to domination of discouraged-worker effect over added-worker effect.

Discouraged worker effect, thus hidden unemployment, has several implications in terms of economic growth and development.<sup>8</sup> Furthermore, female labor-force participation and economic development have long been dwelled on in the literature. There are many studies examining the relationship between female labor force participation and economic development. Among these studies are Durand (1975), Pampel and Tanaka (1986), Psacharopoulos and Tzannatos (1989), Kottis (1990), and Goldin (1994).

#### 4. Conclusion

This paper investigates the existence of long-run relationship between labor-force participation rate and unemployment and added /discouraged worker effect. There is no cointegration between *lfp* and *un* for males signaling that changes in unemployment rate do not alter the decisions of males about participating the labor force. In other words, there appeared to be no evidence for added worker or discouraged worker effect for males.

---

<sup>7</sup> It should be noted that there exists a long-term relationship between female *lfp* and male unemployment rate and female *lfp* and aggregate unemployment rate. However, FM-OLS results for only female *lfp* and aggregate unemployment rate give significant and negative estimates similar to results in Table 3.

<sup>8</sup> See ACOSS (2003) for detailed information.

On the other hand, the empirical results show that *lfp* and *un* for females have a long-run relationship and there is evidence for discouraged worker effect for them. The findings suggest that an increase in the unemployment rate brings about "hidden unemployment," for females.

The undercount of unemployment stemming from discouraged worker effect can be substantial.<sup>9</sup> Therefore, the importance of this behavior pattern should be considered by policy makers. Labor force participation increases aggregate economic efficiency and development potentials of the economies. As for females, it is also important in terms of equity and efficiency respects (Tansel, 2002).<sup>10</sup> As a result, decline in unemployment rates can help canalize the discouraged female workers into the labor force and thus increase participation rates. The analysis in this study may prove fruitful to policy makers in designing policies for labor market.

.

## References

Australian Council of Social Service (ACOSS) (2003) Hidden unemployment in Australia, No.131.

Agbola, F.W (2005) Integrating hidden unemployment in the measurement of unemployment in the selected OECD countries. Applied Econometrics and International Development AEID, Vol. 5-2 : 91-108.

Barth, P.S. (1968) Unemployment and labor force participation. Southern Economic Journal 34 (3): 375-382.

Durand, J.D. (1975) *The Labor Force in Economic Development*, Princeton, Princeton University Press.

Ehrenberg, R.G., Smith, R.S. (2012) *Modern Labor Economics*, 11<sup>th</sup> ed. Prentice Hall.

Emerson, J. (2011) Unemployment and labour-force participation in the United States. Economics Letters, 111: 203-206.

Goldin, C. (1994) The U-Shaped female labor force function in economic development and economic history, NBER Working Paper No.4707.

Gustavsson, M., Österholm, P. (2006) The informational value of unemployment statistics: A note on the time series properties of participation rates. Economics Letters, 92: 428–433.

---

<sup>9</sup> See, for example, Schwietzer and Smith (1974), Mitchell (2000), and Tansel (2002), among others.

<sup>10</sup> See also Mammen and Paxon (2000) for the discussion of role of women and level of economic development.



Kakinaka, M., Miyamoto, H. (2012) Unemployment and labour force participation in Japan. *Applied Economics Letters*, 19 (11): 1039-1043.

Kottis, A.P. (1990) Shifts over time and regional variation in women's labor force participation rates in a developing economy. *Journal of Development Economics*, 33: 117-132.

Levin, A., Lin, C. and Chia-Shang J. Chu (2002) Unit root test in panel data: asymptotic and finite sample properties. *Journal of Econometrics*, 108(1): 1-24.

Mammen K., Paxon, C. (2000) Women's work and economic development. *Journal of Economic Perspectives*, 14 (4): 11-164.

Mincer, J. (1962) Labor force participation of married women: A study of labor supply, in H. G. Lewis (Ed.), *Aspects of Labor Economics*, National Bureau of Economic Research, Princeton University Press, 63-106.

Mincer, J. (1966) Labor force participation and unemployment: A review of recent evidence, in Gordon, R.A. (Ed.), *Prosperity and Unemployment*, New York, Wiley, 73-112.

Mitchell, William F., Mitchell, C. E., Watts, M.J. and Butterworth, A. (1995) *Womens Prospects in the Economic Recovery*, Australian Government Public Service, Canberra.

Mitchell, W.F. (2000) Hidden unemployment in Australia and the United States—updated estimates, Centre of Full Employment and Equity, Working Paper No. 00-08, The University of New Castle.

Murphy, K.M., Topel, R. (1997) Unemployment and nonemployment. *American Economic Review*, 87: 295–300.

Österholm, P. (2010) Unemployment and labour-force participation in Sweden. *Economics Letters*, 106: 205–208.

Pampel, F.C. and K. Tanaka (1986) Economic Development and Female Labor Force Participation: A Reconsideration. *Social Forces*, 64(3): 599-619.

Pedroni, P. (2000) Fully modified OLS for heterogeneous cointegrated panels, in Baltagi, B. (Ed.), *Nonstationary Panels, Panel Cointegration, and Dynamic Panels*, *Advances in Econometrics*, Amsterdam: JAI Press, 93–130.

Pesaran, M. H. (2007) A simple panel unit root test in the presence of cross section dependence. *Journal of Applied Econometrics*, 22(2): 265–312.

Psacharopoulos, G. and Z. Tzannatos (1989) Female Labor Force Participation: An International Perspective. *World Bank Research Observer*, 4(2): 187-201.

Schweitzer, S.O., Smith, R.E. (1974) The Persistence of the Discouraged Worker Effect. *Industrial and Labor Relations Review*, 27(2): 249-260.

Tansel, A. (2002) Economic development and female labor force participation in Turkey: Time-Series evidence and cross-province estimates. ERC Working Papers in Economics 01/05T.

Westerlund, J. (2007) Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics*, 69(6): 709-748.

Westerlund, J., Edgerton D.L. (2007) A panel bootstrap cointegration test. *Economic Letters*, 97: 185-190.

Wooden, M. (1996) Hidden unemployment and underemployment: Their nature and possible impact on future labour force participation and unemployment. National Institute of Labour Studies Working Paper No. 140, Flinders University of South Australia.