Evidence Regarding the Persistence in Gender Unemployment Gaps Across Countries

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Abstract

We provide empirical evidence regarding the persistence in the gender unemployment gap in a group of 23 OECD countries. The gender unemployment gap, measured as the ratio of the female unemployment rate to the male unemployment rate, is stationary for fourteen out of the 23 countries in our sample. Further, the extent of persistence in the gender unemployment gap is relatively low as reflected by the corresponding half-life measures across all countries in our sample.

Introduction

In a recent paper, Queneau and Sen (2009) present empirical evidence regarding the persistence in the gender unemployment gap. A gap between the female unemployment rate (u^F) and the male unemployment rate (u^M) reveals possible differences in the economic status of women relative to men. To this end, Queneau and Sen (2007) propose using the ratio of the female unemployment rate to the male unemployment rate as a measure for the gender unemployment gap, denoted by u^R ($= u^F/u^M$). Any significant and sustained gender unemployment gap will reflect underlying inequalities in the labor market that would be of substantial interest to policymakers. Further, the extent of persistence in the gender unemployment gap determines the impact of shocks on the gender unemployment gap. Therefore, from a policy perspective, a relatively low level of persistence in the unemployment gap series indicates that labor market institutions help dissipate such shocks relatively quickly.

We present an empirical analysis regarding the persistence in the gender unemployment gap across 23 OECD countries. Our results complement the findings of Queneau and Sen (2009), wherein the same group of 23 countries were examined using the unit root test proposed by Perron (1997). However, we use the minimum LM statistic of Lee and Strazicich (2004) to test for the presence of a unit root in the gender unemployment gap series. The advantage of using the minimum LM unit root test is that it allows for a break under the unit root null hypothesis, and it is therefore able to guard against spurious rejection of the null hypothesis in the presence of a break. Our results, in addition to those presented by Queneau and Sen (2009), provide valuable empirical evidence and insight for policymakers to help them understand underlying structural issues that may contribute to the extent of persistence in the gender unemployment gap.

Data and Methodology

Queneau and Sen (2007) have argued that u^R is a normalized measure of the gender unemployment gap and should be used to evaluate the gender unemployment gap over time. Therefore, we assess the ratio of the female-to-male unemployment rate (u^R) series for the following group of 23 OECD countries: Austria,

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Australia, Canada, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, South Korea, Luxembourg, The Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States. Table 1 summarizes the time periods over which the gender unemployment rates are analyzed for each country in our sample, and Figures 1 to 23 show the plot of the u^R series for all countries in our sample. Data on the unemployment rates were obtained from the OECD.Stat Extracts database (http://stats.oecd.org/WBOS).

The numeric value of u^R provides insight regarding the relationship between u^F and u^M. Queneau and Sen (2009) categorize countries into four distinct groups depending on the value and trend in the gender unemployment gap. The first group consists of seven countries (Denmark, Greece, Italy, The Netherlands, Portugal, Spain, and Switzerland) for which the female unemployment rate is greater than the male unemployment rate ($u^R > 1$) for most of the sample period. The second group consists of three countries (Finland, Korea, and the United Kingdom) for which the female unemployment rate remains below the male unemployment rate ($u^R < 1$) for the majority of the sample period. The third group consists of four countries (Canada, Germany, Ireland, and Japan) for which the ratio of the female-to-male unemployment rates fluctuates around 1, though there are periods when the female unemployment rate could be larger or smaller compared to the male unemployment rate. The fourth and final group consists of the remaining nine countries (Australia, Austria, Belgium, France, Luxembourg, New Zealand, Norway, Sweden, and the United States), in which the gender unemployment gap is high toward the beginning of the sample, but subsequently falls toward the latter part of the sample. The only exceptions are Belgium and Norway, for which the gender unemployment gap is less than 1 at the very beginning of the sample, then rises fairly quickly around 1970, and subsequently falls off for the remainder of the sample. We thus can see that there are substantial differences in the underlying trends and patterns of the ratio of female-to-male unemployment rates across the countries.

In order to assess the level of persistence in the gender unemployment gap, we use different versions of unit root tests to determine the appropriate characterization of gender unemployment gap dynamics. While rejection of the unit root null hypothesis indicates that the gender unemployment gap exhibits relatively low persistence (that is, shocks have a transitory effect and dissipate quickly), failure to reject the unit root hypothesis implies that the impact of shocks to the gender unemployment gap are persistent and have a significant effect over time. To help assess the degree of persistence in the gender unemployment gaps, we use the half-life measure of a unit shock (denoted by HL_α) to the series. The half-life, calculated as $|\log(1/2)/\log(\alpha)|$, measures the time required for a shock to decay to half its initial value; see Andrews (1993) for a discussion of the half-lives measure for persistence.

We first calculate the Augmented Dickey-Fuller (ADF) unit root tests based on the following regressions:

$$y_t = \hat{\mu} + \hat{\alpha}\, y_{t-1} + \sum_{j=1}^{k^*} \hat{c}_j\, \Delta y_{t-j} + \hat{e}_t \qquad (1)$$

$$y_t = \hat{\mu} + \hat{\beta}\, t + \hat{\alpha}\, y_{t-1} + \sum_{j=1}^{k^*} \hat{c}_j\, \Delta y_{t-j} + \hat{e}_t \qquad (2)$$

The ADF test from regression (1) without a time trend is denoted by t_μ, and the ADF test from regression (2) with a time trend is denoted by t_τ. Although the results for all series are summarized in Queneau and Sen (2009), we have provided this information in the present paper for convenience (see Table 2). The main results can be summarized as follows. First, the gender unemployment gaps for Japan and Switzerland fluctuate around a constant mean, and the gender unemployment gaps for Austria, Denmark, Finland, Luxembourg, and Portugal fluctuate around a trend. Second, the trend in the gender unemployment gap is falling in Austria, Finland, Luxembourg, and Portugal but is increasing marginally in Denmark. Finally, the extent of persistence in the gender unemployment gap, as measured by the half-life (HL_α), is relatively low, ranging from 0.59 years for Luxembourg to 1.92 years for Portugal.

In the eventuality that the unit root null hypothesis is not rejected by the ADF tests (t_μ and t_τ), we use the minimum LM unit root test proposed by Lee and Strazicich (2004), which allows for a one-time break in the trend function at an unknown break-date.[1]

Lee and Strazicich (2004) specify the underlying data generating process as

$$y_t = \theta' Z_t + X_t \quad , \quad X_t = \beta X_{t-1} + \varepsilon_t \tag{3}$$

where $Z_t = [1 , t , D_t , DT_t]$ and D_t and DT_t are indicator functions defined as $D_t = 1(t \geq T_b + 1)$ and $DT_t = (t - T_b)\ 1(t \geq T_b + 1)$, respectively. For a given break-date $T_b = [\lambda T]$ for any λ in $[\lambda_0, 1–\lambda_0]$, we calculate the t-statistic for H_0: $\phi = 0$, denoted by $\tilde{\tau}$, from on the following regression based on the LM (score) principle:

$$\Delta y_t = \delta' \Delta Z_t + \phi \tilde{S}_{t-1} + \sum_{j=1}^{k^*} c_j\, \Delta \tilde{S}_{t-j} + u_t \tag{4}$$

where $\tilde{S}_t = y_t - \tilde{\psi}_x - \tilde{\delta} Z_t$, $\tilde{\delta}$ are the coefficients in the regression of Δy_t on ΔZ_t, and $\tilde{\psi}_x$ is the restricted MLE of $\psi_x (\equiv \psi + X_0)$, which is given by $y_1 - \tilde{\delta} Z_1$. The extra "k*" regressors $\{\Delta \tilde{S}_{t-j}\}_{j=1}^{k^*}$ are included in the regression to account for additional correlation in the time series $\{\Delta y_t\}$. In practice, the value of the lag-truncation parameter (k^*) is unknown, and so we use Perron and Voglesang's (1992) k(t-sig) method for selecting the lag-truncation parameter k^*.[2]

We calculate Lee and Strazicich's (2004) statistic for all u^R series for which the ADF tests did not reject the unit root null hypothesis. The results for the u^R series are presented in Table 3. For each series, we report the Lee and Strazicich (2004) statistic, the estimated break-date, the estimated break-fraction, the estimate of β implied by $\hat{\phi}$ of regression (4), and the estimated standard error of regression (4). The minimum LM unit root statistic is significant for the u^R series in seven countries: France, Greece, Italy, Korea, New Zealand, Spain, and Sweden. In these cases, the gender unemployment gap is stationary around a broken trend, and so shocks to the gender unemployment gap are not persistent. This is confirmed by the corresponding half-lives that range between 0.15 years for Greece and 0.72 years for Sweden.

In addition, the estimated coefficients corresponding to the trend and the trend-dummy show that the gender unemployment gap has a negative trend after 1977 in France, after 1988 in Greece, after 1975 in Italy, and after 1984 in The Netherlands. However, the gender unemployment gap has a positive trend after 1988 in Korea, after 1985 in Spain, and after 1990 in Sweden. These trends indicate that the gender unemployment gap diminishes in France, Italy, Korea, The Netherlands, and Sweden but remains fairly large in favour of men in Greece and Spain.

The unit root null hypothesis cannot be rejected using either version of the ADF statistic or the minimum LM test of Lee and Strazicich (2004) in nine countries: Australia, Belgium, Canada, Germany, Ireland, The Netherlands, Norway, the United Kingdom, and the United States. Therefore, we cannot reject the null hypothesis that the gender unemployment gaps in these countries are relatively persistent. The half-lives corresponding to these countries range between 0.74 years for The Netherlands and 2.33 years for the United Kingdom, which suggests that the extent of persistence is relatively low across all countries in our sample.

Conclusion

We examine the extent of persistence in the gender unemployment gap across a group of 23 OECD countries. Following Queneau and Sen (2007), we use the ratio of the female unemployment rate to the male unemployment rate to measure the gender unemployment gap. We used the minimum LM unit root test of Lee and Strazicich (2004) to assess the extent of persistence in the gender unemployment gap. While the empirical results show that the unit root null hypothesis cannot be rejected for nine of the 23 countries in our sample, the extent of persistence in gender unemployment gap is relatively low in all countries.

Acknowledgments

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Notes

[1] Our data spans, at best, the period 1955 to 2007, and for most countries, data is available for an even shorter time period. In addition, the Lee and Strazicich (2003, 2004) testing procedure requires specification of the trimming parameter λ_0 (= 0.1) that reduces further the sample over which we search for a break in the trend function. Given that we view structural breaks as fundamental shifts in the economy, we decided to use the one-break unit root tests of Lee and Strazicich (2004) rather than the two-break unit root tests of Lee and Strazicich (2003).

[2] First, we specify an upper bound "kmax" for the lag-truncation parameter. The chosen value of the lag-truncation parameter (k^*) is determined according to the following "general-to-specific" procedure: the last lag in an autoregression of order k^* is significant, but the last lag in an autoregression of order greater than k^* is insignificant. The significance of the coefficient is assessed using the 10% critical values based on a standard normal distribution.

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TABLE 1
Countries and the Corresponding Time Periods

Country	Country code	Period	Sample size (T)
Australia	AUS	1964–2007	44
Austria	AUT	1968–2007	40
Belgium	BEL	1956–2007	52
Canada	CAN	1956–2007	52
Denmark	DEN	1969–2007	39
Finland	FIN	1959–2007	49
France	FRA	1963–2007	45
Germany	DEU	1956–2007	52
Greece	GRC	1977–2007	31
Ireland	IRL	1961–2007	47
Italy	ITA	1958–2007	50
Japan	JPN	1955–2007	53
South Korea	KOR	1963–2007	45
Luxembourg	LUX	1975–2007	33
Netherlands	NLD	1975–2007	33
New Zealand	NZL	1975–2007	41
Norway	NOR	1956–2007	52
Portugal	PRT	1974–2007	34
Spain	ESP	1970–2007	38
Sweden	SWE	1963–2007	45
Switzerland	CHE	1975–2007	33
United Kingdom	GBR	1956–2007	52
United States	USA	1956–2007	52

TABLE 2
ADF Tests for the u^R Series of OECD Countries

	Without trend	With trend									
Series	k*	t_μ	$\hat{\alpha}$	$\hat{\mu}$	HL_α	k*	t_τ	$\hat{\alpha}$	$\hat{\mu}$	$\hat{\beta}$	HL_α
u^R (AUS)	4	**-4.21**^{a}	0.82	0.157	**3.49**	7*	-0.56	0.958	-0.341	0.0137	—
u^R (AUT)	0	**-3.26**^{b}	0.669	0.449	**1.73**	0	**-3.93**^{b}	0.438	1.097	-0.0152	**0.84**
u^R (BEL)	0	-1.27	0.943	0.094	—	0	-0.93	0.957	0.109	-0.0013	—
u^R (CAN)	0	-1.84	0.916	0.086	—	0	-1.38	0.932	0.09	-0.0007	—
u^R (DEN)	0	**-3.97**^{a}	0.395	0.751	**0.75**	0	**-4.02**^{b}	0.363	0.734	0.0028	**0.68**
u^R (FIN)	4	-1.33	0.88	0.118	—	1	**-4.32**^{a}	0.468	0.233	0.0079	**0.91**
u^R (FRA)	3	-0.94	0.951	0.06	—	3	-2.95	0.605	0.92	-0.0126	—
u^R (DEU)	1	-2.33	0.872	0.146	—	1	-2.36	0.862	0.142	0.0006	—
u^R (GRC)	0	-1.97	0.748	0.593	—	0	-2.44	0.654	0.717	0.0061	—
u^R (IRL)	0	-2.17	0.806	0.164	—	0	-2.62	0.729	0.182	0.002	—
u^R (ITA)	0	-1.45	0.94	0.132	—	0	-2.18	0.915	0.27	-0.0035	—
u^R (JPN)	0	**-3.03**^{c}	0.697	0.299	**1.92**	0	-3.14	0.681	0.331	-0.0007	—
u^R (KOR)	1	-1.52	0.85	0.096	—	1	-2.02	0.78	0.102	0.0017	—
u^R (LUX)	0	**-3.27**^{c}	0.491	0.74	**0.98**	0	**-4.47**^{a}	0.312	1.223	-0.0135	**0.59**
u^R (NLD)	0	-2.24	0.792	0.3	—	0	-1.91	0.813	0.305	-0.0021	—
u^R (NZL)	0	-2.1	0.754	0.287	—	0	-2.38	0.653	0.525	-0.0071	—
u^R (NOR)	2	-1.74	0.872	0.143	—	2	-1.54	0.882	0.167	-0.0013	—
u^R (PRT)	4	-1.2	0.893	0.16	—	3	**-5.03**^{a}	0.306	1.737	-0.0314	**0.59**
u^R (ESP)	4	-1.67	0.298	-1.668	—	1	-1.64	0.797	0.25	0.0045	—
u^R (SWE)	3	-1.82	0.85	0.151	—	1	-2.86	0.522	0.667	-0.0069	—
u^R (CHE)	0	**-3.86**^{a}	0.494	0.711	**0.98**	0	**-3.69**^{c}	0.499	0.717	-0.0007	**1**
u^R (GBR)	1	-1.77	0.907	0.061	—	1	-2.45	0.866	0.047	0.0016	—
u^R(USA)	0	-1.52	0.906	0.101	—	1	-2.77	0.782	0.306	-0.0024	—

Note: The superscripts a, b, c, and d denote significance at the 1%, 2.5%, 5% and 10% levels, respectively. The superscript * denotes near-significance at the 10% level. The finite sample critical values corresponding to T = 25 and T = 50 were taken from Table 4.2 in Banerjee, Dolado, Galbraith, and Hendry (1993:103). The critical values for the ADF unit-root tests (t_μ) without trend: for T = 25, -2.63 at the 10% level, -3.00 at the 5% level, -3.33 at the 2.5% level, -3.75 at the 1% level; for T = 50, -2.60 at the 10% level, -2.93 at the 5% level, -3.22 at the 2.5% level, -3.58 at the 1% level. The critical values for the ADF unit-root tests with trend (t_τ): for T = 25, -3.24 at the 10% level, -3.60 at the 5% level, -3.95 at the 2.5% level, -4.38 at the 1% level; for T = 50, -3.18 at the 10% level, -3.50 at the 5% level, -3.80 at the 2.5% level, -4.15 at the 1% level. We extrapolated the critical values for the given sample sizes based on these critical values.

TABLE 3
Minimum LM Unit-Root Test for the u^R Series of OECD Countries

Series	$\hat{T}_b$	$\hat{\lambda}$	k^*	$\hat{\beta}$	Test statistic	$\hat{\sigma}^2$	HL_α
u^R (AUS)	1982	0.38	3	0.4423	–3.1537	0.1435	0.81
u^R (BEL)	1973	0.35	3	0.5567	–3.264	0.1712	1.18
u^R (CAN)	1972	0.33	3	0.5288	–3.2718	0.0725	1.09
u^R (FRA)	1977	0.33	4	0.0145	–5.3640[a]	0.1054	0.16
u^R (DEU)	1972	0.33	1	0.6623	–3.9908	0.0988	1.68
u^R (GRC)	1988	0.39	2	0.0102	–4.6312[b]	0.1518	0.15
u^R (IRL)	1985	0.53	0	0.5739	–3.372	0.1015	1.25
u^R (ITA)	1975	0.36	0	0.4141	–4.3180[c]	0.0877	0.79
u^R (KOR)	1988	0.58	0	0.2704	–4.7930[b]	0.0796	0.53
u^R (NLD)	1986	0.36	1	0.3905	–3.9936	0.1011	0.74
u^R (NZL)	1984	0.39	1	0.2423	–7.1768[a]	0.1169	0.49
u^R (NOR)	1978	0.44	4	0.4704	–3.6475	0.2185	0.92
u^R (ESP)	1985	0.42	3	0.2215	–4.7966[b]	0.1001	0.46
u^R (SWE)	1990	0.62	0	0.3799	–4.2399[c]	0.1732	0.72
u^R (GBR)	1981	0.5	4	0.7431	–2.7674	0.0737	2.33
u^R (USA)	1979	0.48	4	0.586	–3.4649	0.0716	1.3

Notes: $\hat{\beta}$ is estimated as $\hat{\phi}+1$ based on regression (4). The test statistic is the minimum LM unit root test devised by Lee and Strazicich (2004). We used kmax = 4 for all series except u^R (NLD) for which we used kmax = 3. The superscripts a, b, and c denote significance at the 1%, 5%, and 10% levels, respectively. We extrapolated the critical values for the minimum LM unit root statistics based on Table 1 of Lee and Strazicich (2004) based on the estimated break-fraction.

FIGURE 1
Australia: Ratio of Female to Male Unemployment Rate, 1964 - 2007

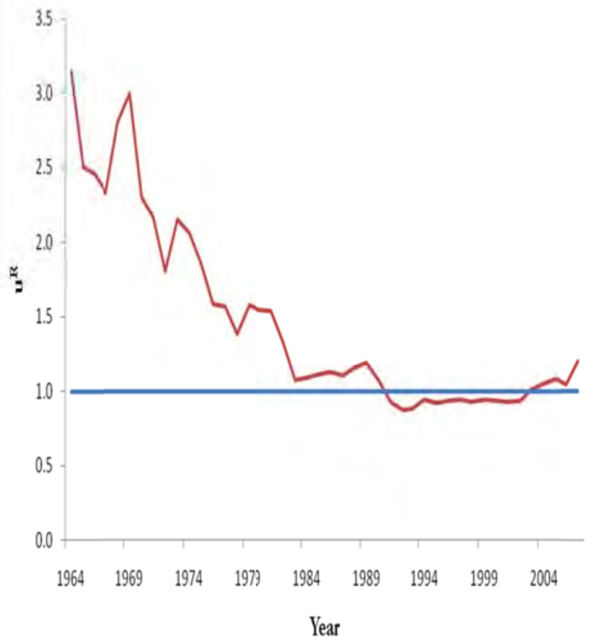

FIGURE 2
Austria: Ratio of Female to Male Unemployment Rate, 1968 - 2007

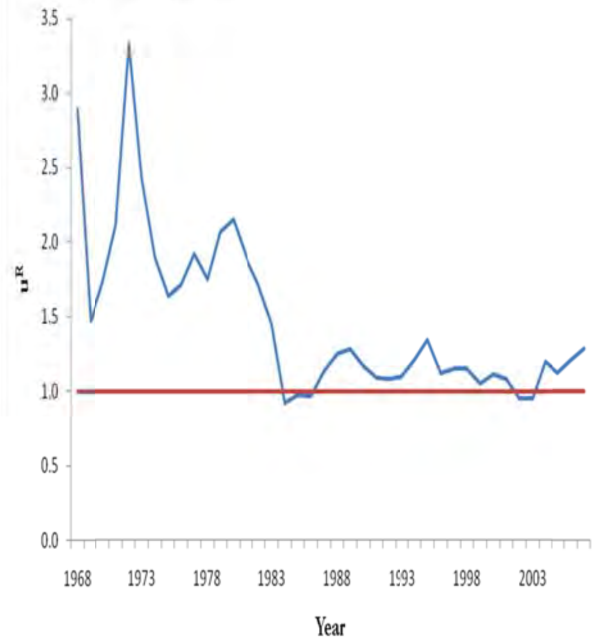

FIGURE 3
Belgium: Ratio of Female to Male Unemployment Rate, 1956 - 2007

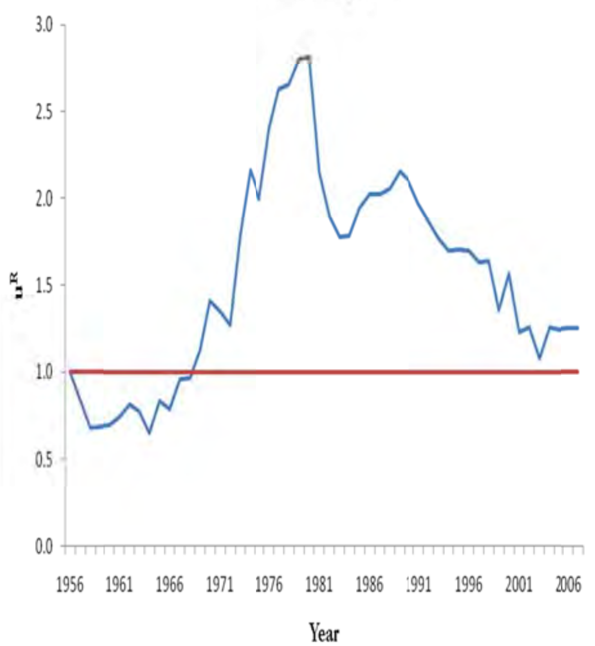

FIGURE 4
Canada: Ratio of Female to Male Unemployment Rate, 1956 - 2007

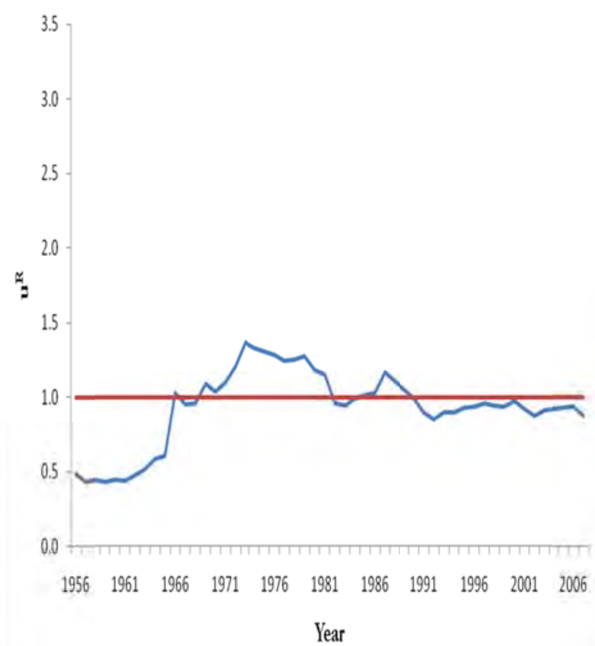

FIGURE 5
Denmark: Ratio of Female to Male Unemployment Rate, 1969- 2007

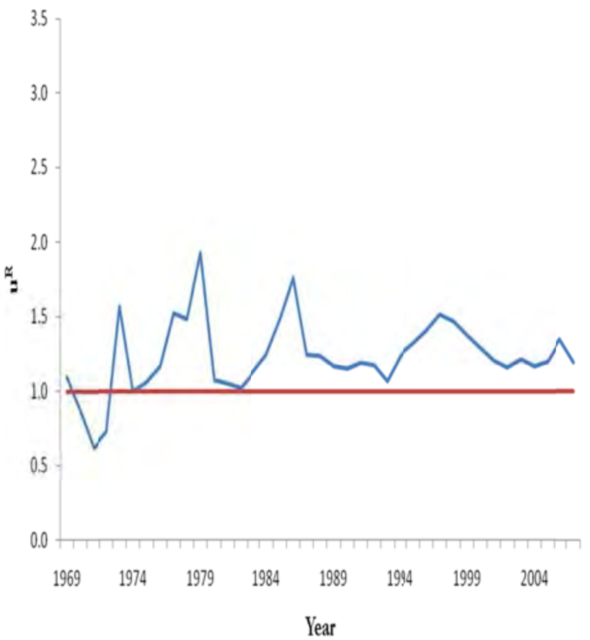

FIGURE 6
Finland: Ratio of Female to Male Unemployment Rate, 1959 - 2007

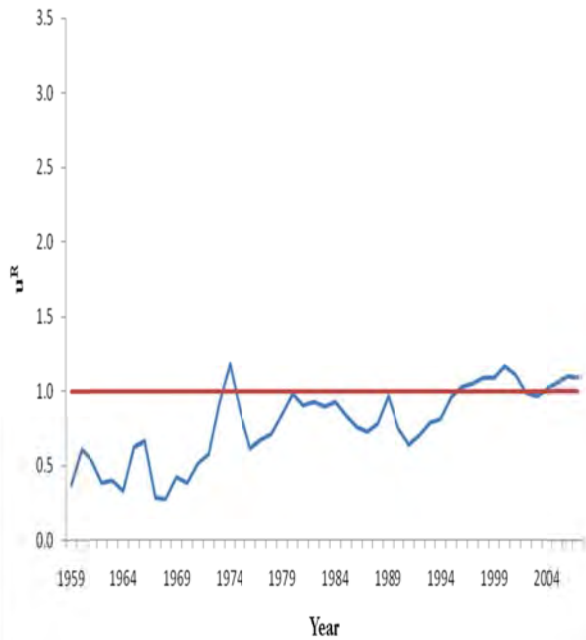

FIGURE 7
France: Ratio of Female to Male Unemployment Rate, 1963 - 2007

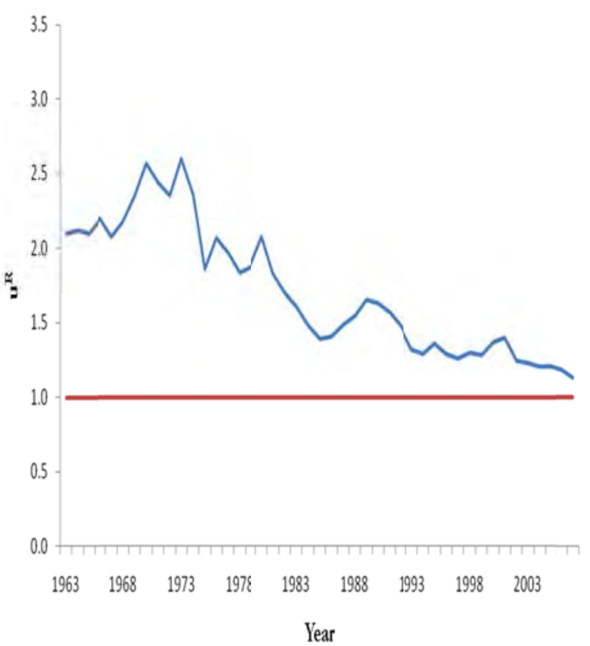

FIGURE 8
Germany: Ratio of Female to Male Unemployment Rate, 1956 - 2007

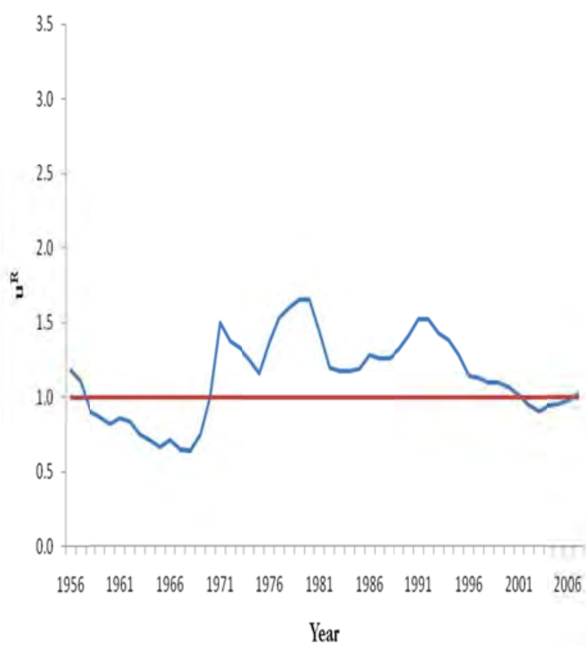

FIGURE 9
Greece: Ratio of Female to Male Unemployment Rate, 1977 - 2007

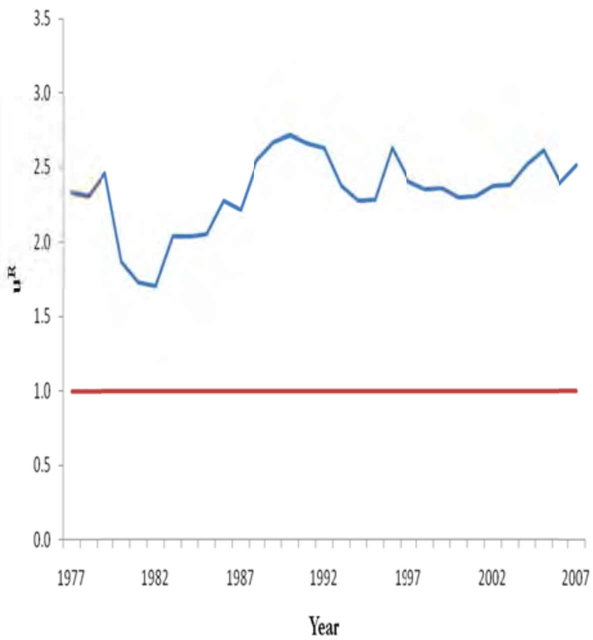

FIGURE 10
Ireland: Ratio of Female to Male Unemployment Rate, 1961 - 2007

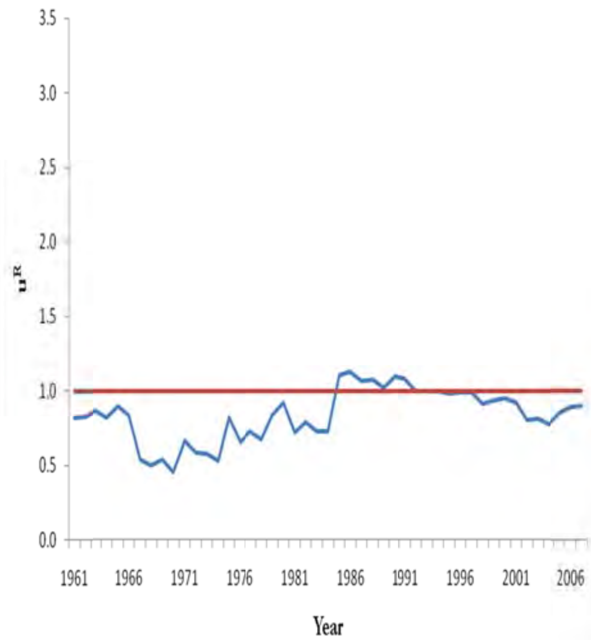

FIGURE 11
Italy: Ratio of Female to Male Unemployment Rate, 1958 - 2007

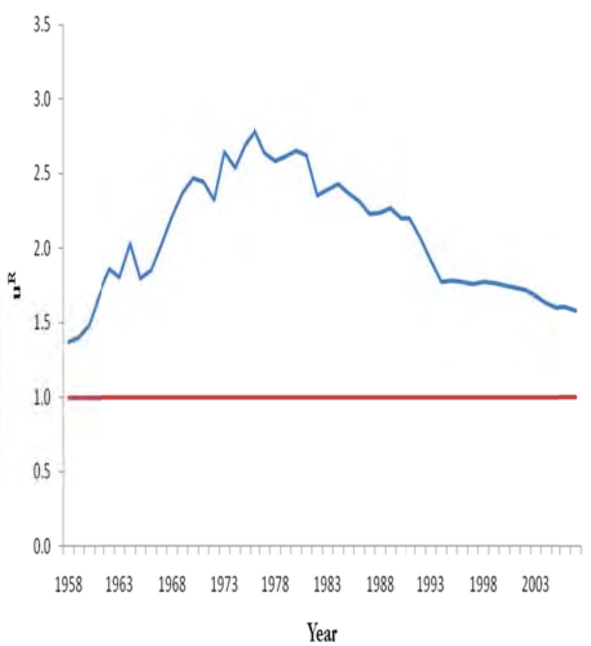

FIGURE 12
Japan: Ratio of Female to Male Unemployment Rate, 1955 - 2007

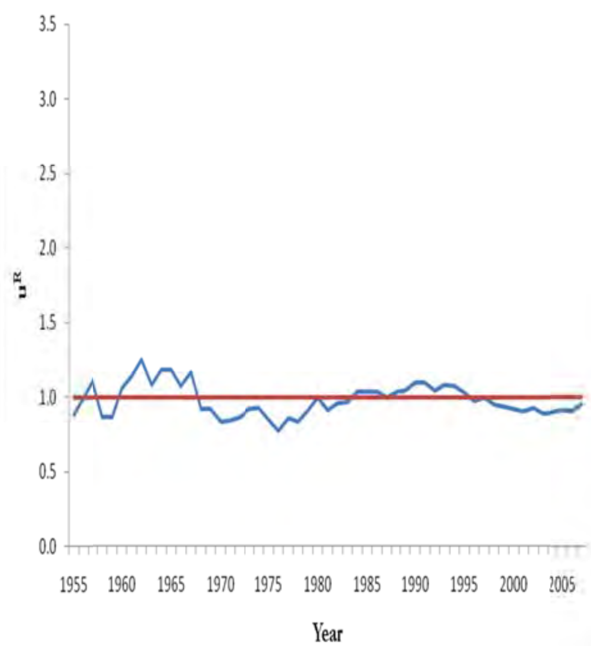

FIGURE 13
Korea: Ratio of Female to Male Unemployment Rate, 1963 - 2007

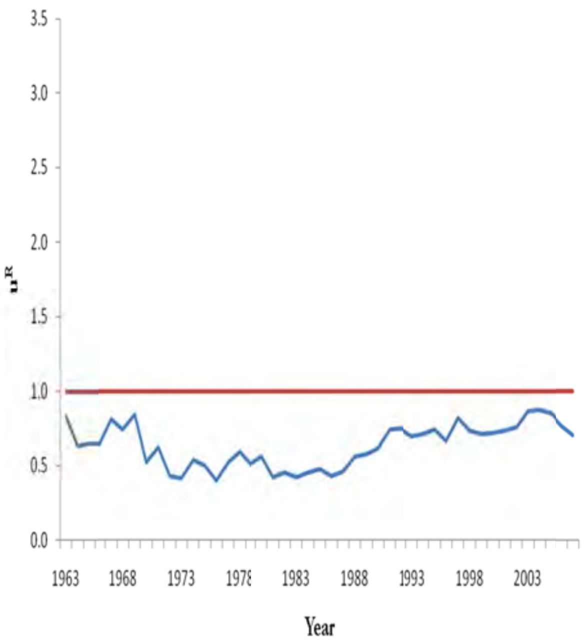

FIGURE 14
Luxembourg: Ratio of Female to Male Unemployment Rate, 1975 - 2007

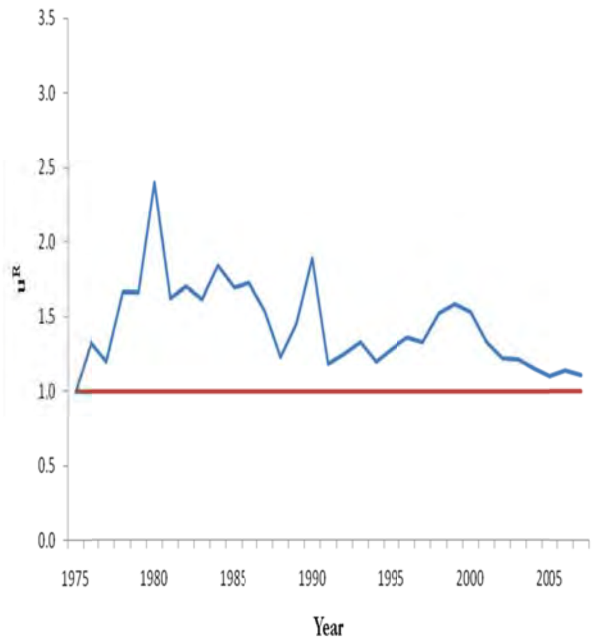

FIGURE 15
The Netherlands: Ratio of Female to Male Unemployment Rate, 1975 - 2007

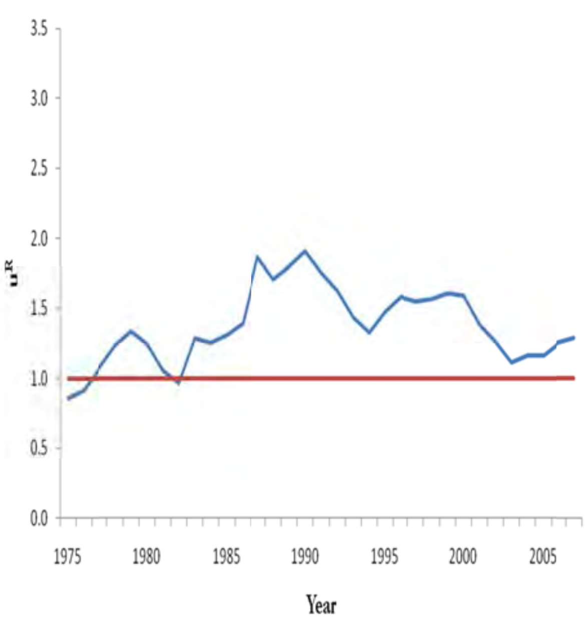

FIGURE 16
New Zealand: Ratio of Female to Male Unemployment Rate, 1975 - 2007

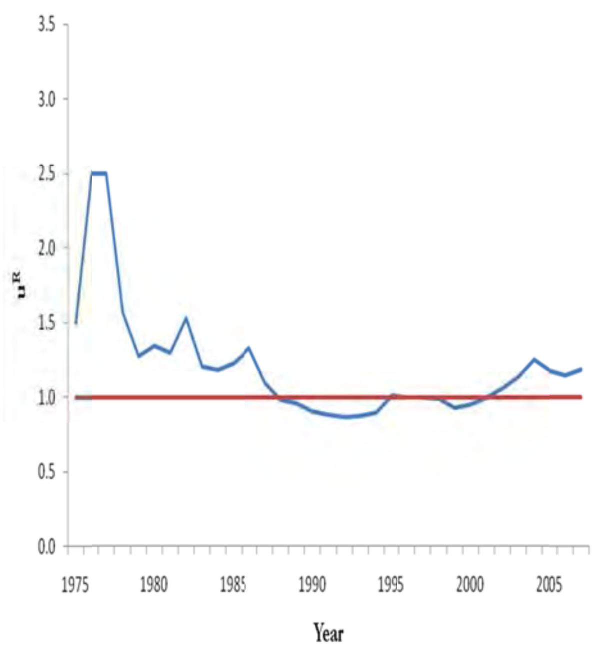

FIGURE 17

Norway: Ratio of Female to Male Unemployment Rate, 1956 - 2007

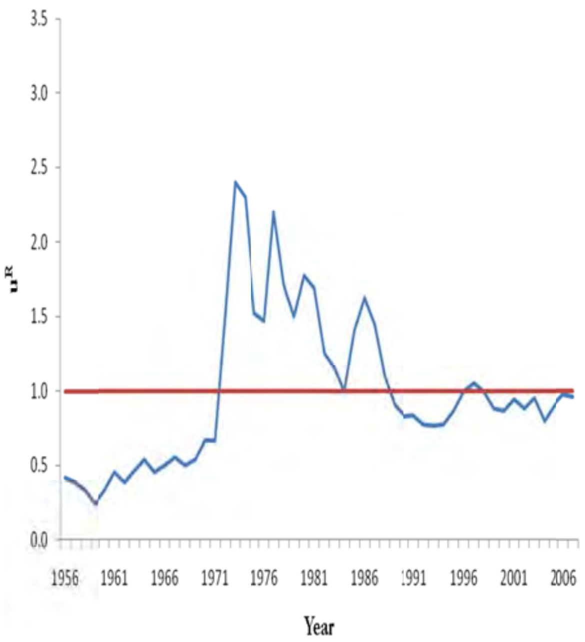

FIGURE 18

Portugal: Ratio of Female to Male Unemployment Rate, 1974 - 2007

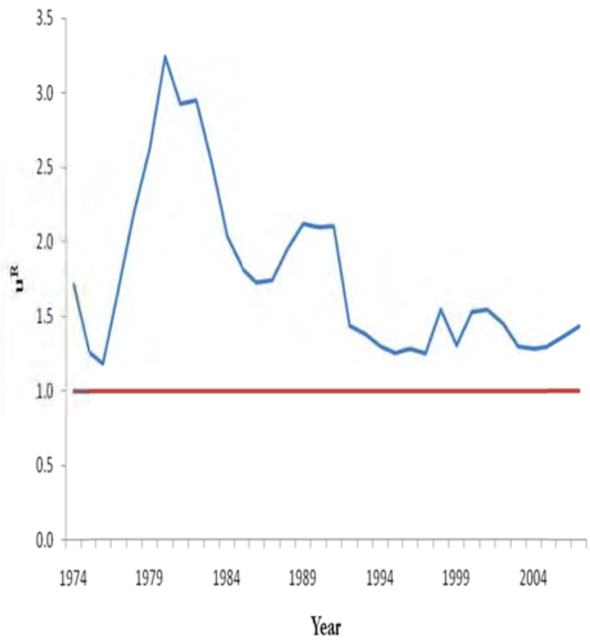

FIGURE 19

Spain: Ratio of Female to Male Unemployment Rate, 1970 - 2007

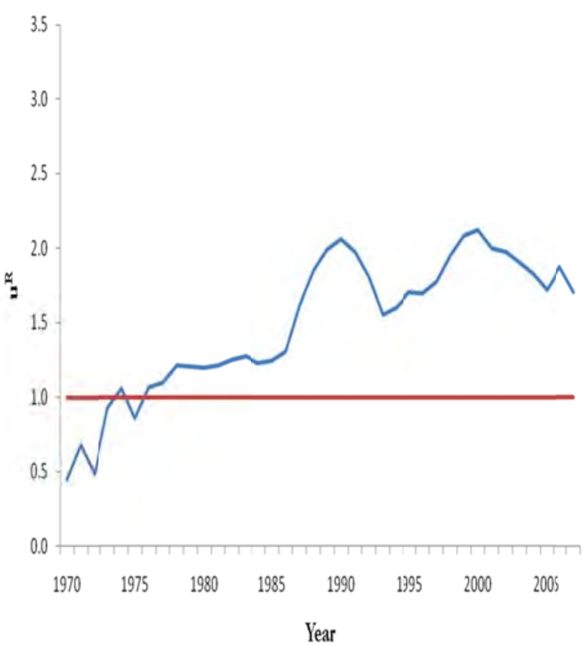

FIGURE 20

Sweden: Ratio of Female to Male Unemployment Rate, 1963 - 2007

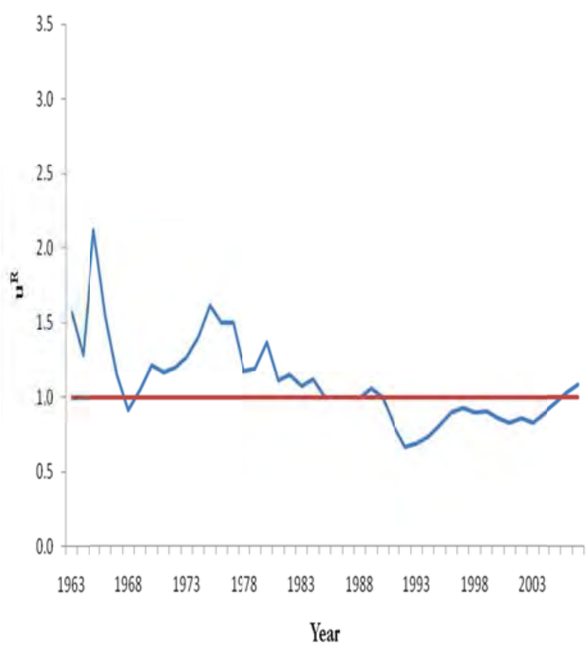

FIGURE 21
Switzerland: Ratio of Female to Male Unemployment Rate, 1975 - 2007

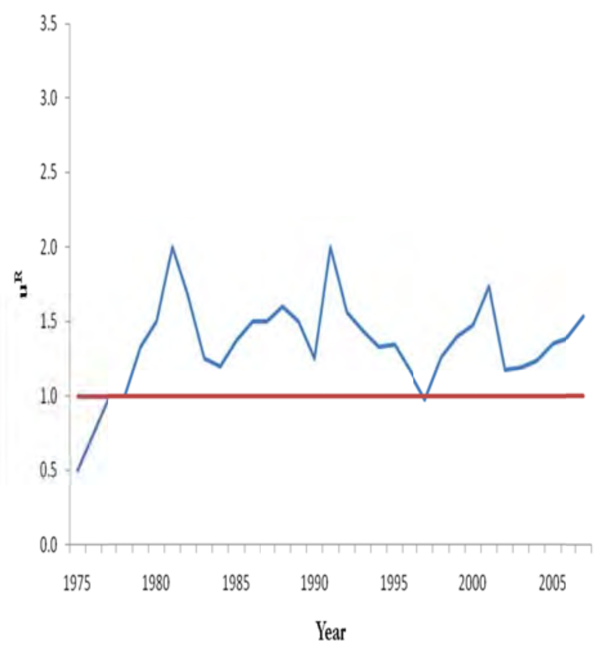

FIGURE 22
United Kingdom: Ratio of Female to Male Unemployment Rate, 1956 - 2007

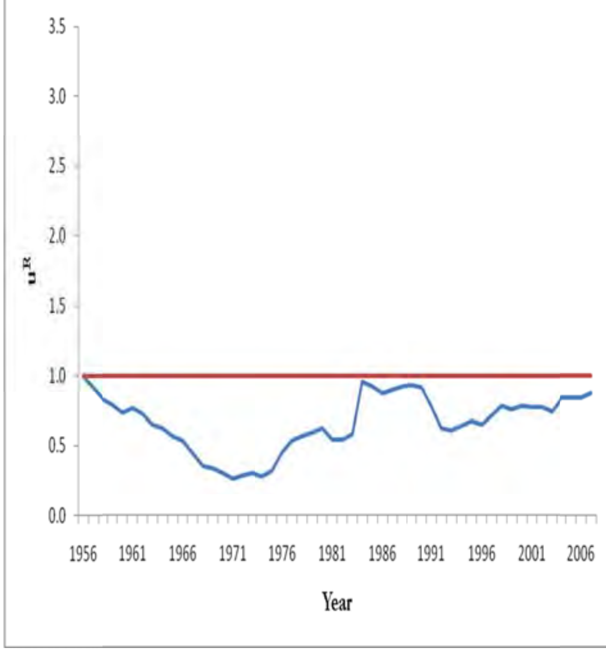

FIGURE 23
United States: Ratio of Female to Male Unemployment Rate, 1956 - 2007