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A Review of Unemployment and Labor Force Participation Rate: Evidence from Sweden, United State and urban China

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ABSTRACT

The purpose of this paper is to review the empirical study of the long-run relationship between unemployment rates and labor force participation rates in the Sweden, United State and urban China. In Sweden, Osterholm (2010) investigated whether unemployment and labor force participation is an issue that has important implications for theory, empirical modeling & policy in labour and macroeconomics. On the other hand Liu (2011) analyzed pattern and trends in labor force participation rate & employment in urban for the past few decade in China. Emerson (2011) did the study for United States on unemployment and labour force participation. While Emerson (2011) and Osterholm (2010) results leads us to question the empirical relevance of the unemployment invariance hypothesis for the United States and Sweden, Liu (2011) provided comprehensive and more up-to-date study on topic with extension in examining employment, type of decomposition to shed light on the source of gender difference.

Introduction

Osterholm (2010) claimed that the relationship between unemployment and labor force participation has important implication not only for theory but for empirical modeling and policy. In the 1970s and 1980s, when many European countries were plagued by high unemployment, Swedish unemployment was low by international standards. This observation generated a fair amount of academic attention and Sweden's labour market has since then often been the focus of economic research.. In particular, the Swedish labour market has an interesting structure with, for example, strong unions, centralized wage bargaining and highly active labour-market policy. Another interesting aspect of the relationship between these two variables is the relevance of the so-called unemployment invariance hypothesis which suggests that the long-run unemployment rate is independent of the labour force. He took a macro-level approach to the empirical investigation of the long-run relationship between Swedish unemployment and labour force participation and based on the time-series properties of the data, the issue is addressed using cointegration techniques.

Emerson (2011) supported Österholm(2011), that the relationship (or lack thereof) between unemployment and labor force participation has important implications not only for theory, but also for empirical modeling and policy in fields of labor economics and macroeconomics. Liu (2011) explained that he economic reforms in China by the end of the 1970s have led to a transition to a market-oriented economy. Paradoxically, the high and sustained GDP growth rate is accompanied by increasing unemployment rates and decreasing labor force participation rates. The official calculation of unemployment rates in China did not start until 1978 and there were very low unemployment rates in the 1980s because the government was helping to place graduates into job positions, and all employments were intended for lifetime, thus the name “iron rice bowl”. But the bankruptcies of the state-owned enterprises starting in the 1990s resulted in massive layoffs.

Theoretical Background

Theory of unemployment and labour force participation

There are many theories related to unemployment and labor participation rate. Theoretically unemployment is influenced by various factors including money supply, prices, wage levels, employment and so on. Labor force participation rates also affect the amount of labor and thus indirectly affect unemployment. Here are some related theories of unemployment and labor force participation rates are emphasized in these studies:

i. The natural rate of unemployment and output

Natural rate of output and unemployment was introduced by Milton Friedman. He said the balance of output and unemployment levels are determined by real factors of production, technology and institutions. In addition, in the long run, output and unemployment is not affected by the Aggregate Demand (AD). For example (see figure 1) when the monetary policy carried out to expand the money supply in the market will create demand aggregate (AD) increases and thus causing the firm to increase the output. The increase in production output caused the firm increased the demand for labor (LD0 to LD1) and employment increased. The increase in employment will reduce the unemployment rate. However, this changes only for the short term because in the long-term output, employment and unemployment back to the balance of the natural rate. Natural unemployment rate is the labor demand equal to labor supply in certain real wage levels. According to this theory will not be able to increase output more than the natural level of output and unemployment cannot be reduced below the natural rate of unemployment. Natural unemployment rate is calculated by:

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$$UN = \frac{\text{Total labour force} - \text{Natural rate of employment}}{\text{Total labour force}}$$

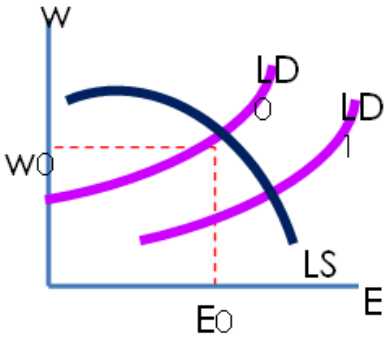

Figure 1: The natural rate of unemployment and output

ii. Real business cycle theory

According to this model, employment and output is not influenced by money supply and prices in the long run. The quantity of labor offered at a time depending on the economic incentives provided, which is positively related to the incentive that if workers are given more incentives (such as salary, income tax deductions and fringe benefits) they are able to increase the hours of work and expense of leisure time. However, if they are given incentives (such as wages) less then they will reduce the hours worked. Sometimes when they are too small remuneration they will stop working, at least for a while. Readiness to change labor time replace work with leisure from time to time is called the substitution between labor times (inter-temporal substitution of labor).

In addition, workers will carry out cost-benefit analysis for time to work and relax. When real wages and high interest rates, labor will increase working time to get a higher income and in part will be allowable for the high returns due to high interest rates. In addition, labor supply is also dependent on the shock effect either positive or negative. The effect of positive shocks or technology shocks cause the curve to shift to the production function and output increased. This technology has increase productivity and total output produced in the same amount of input or were unchanged. Labor will increase the working hours to increase income. Hence, employment rose and followed by increased output. The increase in employment will reduce unemployment. The impact of negative shocks will result in increased production costs and firms choose to reduce the demand for labor and reduce output. Production curve shifts down causing employment and real wages fell, and thus cause unemployment to rise. The negative shock to the labor market is shown in figure 2.

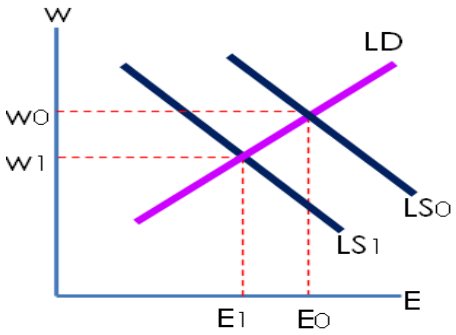

Figure 2: The negative shock to the labor market

iii. Minimum wage policy

Minimum wage has been conducted in more than 90% of countries around the world. The minimum wage is set at the minimum wage regardless of any sector, gender, qualifications and areas. Minimum wage carried out to improve standards of living and reduce poverty. Higher wages cause labor supply exceeds labor demand, and then there is a surplus of labor (unemployment). Minimum wage affects the increase in unemployment among low-skilled workers. This is because firms choose the level skilled labor due to higher wages and also the excess supply of labor.

iv. Discouraged-worker effects

Discouraged-worker effects are one of the factors affecting labor force participation rates. This theory is supported by Murphy and Topel, 1997; Gustavsson and Österholm, 2006. As a general practice, discouraged workers who often classified as “marginally attached to the labor force”, "on the margins" of the labour force, or as part of "hidden unemployment" are not considered to be part of the labor force and are thus not counted in most official unemployment rates, which could result in flawed statistics. Although some countries offer alternative measures of unemployment rate, the existence of discouraged workers can be inferred from a low employment-to-population ratio. In conclusion, trends indicate that there has been a decline in the participation rate and has an influence on the unemployment rate. The reasons for discouragement are:

- The worker thinks no work available.
- The worker could not find work
- The worker lacks schooling or training
- The worker is viewed as too young or old by the perspective employer
- The worker is the target of various types of discrimination.

v. Unemployment invariance hypothesis

Unemployment invariance hypothesis ensures that the long-run unemployment rate is independent of the size of the capital stock, total factor productivity and the labor force. The ‘strong invariance’ hypothesis (e.g. Layard et al.,1991) asserts that any exogenous permanent shock in the capital stock, total factor productivity or the labor supply leads to countervailing shifts in the labor demand, wage-setting and labor supply curves so as to restore the unemployment rate to its original long-run equilibrium. By implication, policies that stimulate capital accumulation or R&D or policies that reduce the size of the labor force (ceteris paribus) can have no effect on the long-run unemployment rate. Now suppose that the labor demand curve shifts outwards to LD2, due to capital accumulation or technological advance. Then, according to the unemployment invariance hypothesis, the wage-setting and/or labor supply curves must shift in the long run so that the unemployment rate remains unchanged (U*).

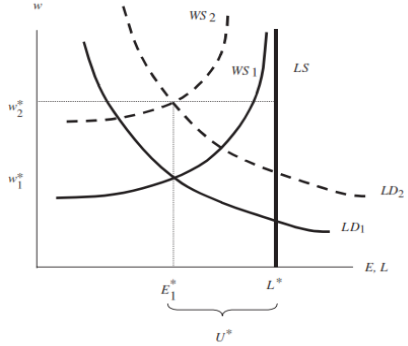

Figure 3: Unemployment invariance hypothesis

Data and empirical results

Unemployment and labour-force participation in Sweden.

Seasonally adjusted monthly data on unemployment (ue) and participation rate (pt) were used for Osterholm (2010) empirical analysis. Apart from the aggregate rates, he also conducted analysis on the male and female unemployment and participation rates to see how robust our findings are. All series range from January 1970 to April 2007 were used. Worth noting are the very large increase in unemployment associated with the crisis of the early 1990s, the upward trend in female participation until the late 1980s, and the downward trend in male participation throughout the sample. Osterholm (2010) wanted to establish the time-series properties of the variables in question as these affect both methodological choices and inference procedures. Moreover, if the unemployment and participation rates are integrated of different orders, no long-run equilibrium relationship can exist between the two. He employed two different unit-root tests to the six series: the Augmented Dickey–Fuller test with GLS detrending (Elliott et al., 1996) and the KPSS test (Kwiatkowski et al.,1992).

The ADF-GLS test has a unit root under the null hypothesis, whereas the KPSS test reverses the burden of proof as it has stationarity under the null. Results, where he has tested for reversion around a constant level, can be found in Table 1 below.

Table 1
Univariate unit-root tests on individual series.

	All		Men		Women	
	p_t	u_t	p_t	u_t	p_t	u_t
ADF-GLS	−0.266	−0.474	−0.155	−0.982	1.231	−0.313
KPSS	0.510*	1.419*	2.188*	1.463*	1.295*	1.358*

Table 2 presents the results from the cointegration tests using Johansen's (1988, 1991) maximum eigenvalue and trace tests. As can be seen, one – and only one – cointegrating vector is supported in all three cases. This suggests that there is a long-run relationship between the two variables.

Table 2
Cointegration tests.

	All		Men		Women	
	J_{max}	J_{trace}	J_{max}	J_{trace}	J_{max}	J_{trace}
$H_0: r=0$	26.411*	30.651*	17.972*	20.601*	50.643*	53.079*
$H_0: r=1$	4.240	4.240	2.628	2.628	2.436	2.436

However, since there is some concern that the labour-force participation and unemployment rates may not have exact unit roots, we should take some extra caution since the Johansen tests are known to have size distortions in such cases. Therefore test whether the restrictions β=(1 0)′ and β=(01)′ can be rejected; if they cannot, we conclude that the cointegration found is not due to a relationship between the variables but a single stationary variable. (Labour-force participation in the first case and unemployment in the second.) Results from these likelihood ratio tests can be found in Table 3.

Table 3
Tests of restrictions in cointegrated VAR.

Restriction	All	Men	Women
$\beta=(1\ 0)'$	21.072*	15.246*	20.007*
$\beta=(0\ 1)'$	6.180*	12.076*	17.922*
$\alpha=(0\ \alpha_2)'$	16.408*	14.924*	48.884*
$\alpha=(\alpha_1\ 0)'$	11.503*	0.829	4.173*

Table 4, presents the cointegrating vectors, where relevant restrictions regarding α have been imposed.

Table 4
Estimated cointegrating vector in preferred model.

	All	Men	Women
$\hat{\beta}$	$(1, 2.555)'$	$(1, 1.439)'$	$(1, 3.479)'$
$se(\hat{\beta}_2)$	0.483	0.165	0.761

There exists a long-run relationship between unemployment and labour-force participation in Sweden. Higher unemployment rate is associated with a lower participation rate. The very large number for women is likely to be a result of a reversed discouraged-worker effect; during the era of low unemployment, women chose to enter the labour force in large numbers. While, the male participation rate adjusts to the male unemployment rate but not vice versa.

Unemployment and labour-force participation in United State.

Emerson (2011) obtained monthly data on for the periods January 1948 through February 2010 from the United States Bureau of Labor Statistics. The variables considered were as follows: U is the seasonally adjusted unemployment rate for ages 16 and over; LFP is the seasonally adjusted labor force participation rate for ages 16 and over. In addition to investigating the relationship between the aggregate rates of unemployment and labor force participation, analysis was also conducted on male and female unemployment rates and labor force participation rates

Following the approach of Österholm (2010), he began his analysis by considering a Vector Error Correction (VEC) model that includes labor force participation rates and unemployment rates. It is important to point out that a VEC model is a restricted VAR (or cointegrated VAR) that has the cointegrating relationship(s) built into the specification so that the endogenous variables are restricted to converge to the long-run equilibriumwhile allowing for short-run adjustment dynamics.

Table 1 reports the results of the Augmented Dickey–Fuller test with GLS detrending (Elliott et al., 1996) and the KPSS test(Kwiatkowski et al., 1992) for each variable.

Table 1
Univariate unit root tests on individual series.

Level Variable	All		Males		Females	
	LFP	U	LFP	U	LFP	U
ADF-GLS (include intercept)	0.469	−1.508	3.582	−2.350**	3.491	−0.851
KPSS (include intercept)	3.141***	0.586**	3.182***	0.747***	3.305***	0.440*

He further investigated the cointegrating relationships. Trace statistics and maximum-eigenvalue statistics (Johansen, 1988, 1991) were used to determine the number of cointegrating relationships. The number of lags included in the underlying vector autoregression (VAR) model was chosen based on the Akaike information criterion. The results of the cointegration tests are reported in Table 2.

Table 2
Cointegration tests.

	All		Males		Females	
	Trace statistic	Maximum-eigenvalue	Trace statistic	Maximum-eigenvalue	Trace statistic	Maximum-eigenvalue
H_0: r = 0	15.541*	14.342*	19.523*	18.036*	29.247*	25.672*
H_0: r = 1	1.200	1.200	1.487	1.487	3.575	3.575

He continued the analysis by estimating the VEC Model. the first step of estimating a VEC model was to estimate the cointegration relationships. The second step is to estimate a VAR in first differences including the error-correction terms (cointegration relationships) estimated in the first step. The

estimated cointegration relationships from the first step are reported in Table 3

Table 3
Estimated cointegrating vector.

	All	Males	Females
LFP	1	1	1
U	−4.901	4.571	−13.730
	(1.268)	(0.085)	(2.875)
Constant	−35.000	−103.662	34.190

To conclude, this study has shown that evidence of the existence of a long-run equilibrium relationship between labor force participation rates and unemployment rates in United States. There are discouraged worker effects for males because higher unemployment rates are associated with lower labor participation rates. However, during periods of high unemployment, it appears that women choose to enter the labor force in large numbers. It could be argued that when unemployment rates are high, women tend to enter the labor force to add to household income. When we consider all workers, it appears that the strong labor force participation of women during periods of high unemployment is helping drive the results. It is also important to note that the labor force participation rate for women has nearly doubled since the beginning of our sample period.

Unemployment and labour-force participation in urban China.

Liu (2011) elaborated that he employed Chinese Household Income Project (CHIP) surveys 1988, 1995 and 2002 for the study. CHIP is one of the very few large-scaled micro-level datasets in China. CHIP is a joint effort between researchers from the Chinese Academy of Social Science and many western scholars. The surveys were collected from various regions of China and are nationally representative. In light of therising unemployment rates from the 1990s, much literature including Giles et al. (2005), Solinger (2002) and Song (2003) has been critical of the Chinese official definition of unemployment and argued that the official numbers are too low.

Knight and Xue (2006) provided a most comprehensive discussion and my arguments follow most of their criticisms. Firstly, the official unemployment rate only refers to the urban citizens and not rural citizens. Secondly, the age ranges it covers are too small. The official retirement age is 60 for men and 55/50 for women, but the official unemployment rate calculation does not include men above 50 and women above 45. Thirdly, those who are in fact unemployed but do not register are not counted as unemployed. Fourthly and most critically, laid-off/XiaGang workers are not regarded as unemployed. Focus only on the urban household surveys. There are parallel surveys in the rural areas, but the rural labor markets are more likely to be involved in farming and as long as farmers had access to the land they would not be regarded as unemployed.

Logit analyses were used to estimate the models for labor force participation and employment. He defined employment as the probability of being employed, conditional of being in the labor force. The explanatory variables include six dummy variables for age groups, number of children less than seven years of old, the number of children between seven and eighteen years old dummy variables for six education levels, one dummy variable for being a communist party member, one dummy variable for being an ethnic minority as well as dummies for provinces. In 1995 and 2002, the model also controls for marital status, and in 2002 there is one additional covariate, namely HuKou status (the permanent resident permit in the residing city).

Tables 4 and 5 show the regression results for the participation model and employment model respectively. The participation model runs for 1988, 1995 and 2002, while the employment model only runs for 1995 and 2002, the reason being that there was virtually no unemployment in 1988. All regressions are run for men and women separately

Table 4
Logit analysis of the probability of labor force participation, marginal effects.

	1988		1995		2002	
	Men	Women	Men	Women	Men	Women
Ages [25,29]	0.003	0.019	0.010	0.028	0.049	0.164
	(3.215)	(7.757)	(5.183)	(3.307)	(12.835)	(16.869)
Ages [30,34]	0.005	0.022	0.015	0.050	0.058	0.209
	(4.063)	(8.241)	(4.830)	(5.890)	(11.712)	(19.590)
Ages [35,39]	0.006	0.016	0.013	0.033	0.070	0.197
	(4.317)	(5.506)	(3.788)	(3.026)	(11.340)	(14.252)
Ages [40,44]	0.004	0.004	0.015	0.029	0.062	0.193
	(3.336)	(0.972)	(3.905)	(2.515)	(9.343)	(13.156)
Ages [45,49]	0.000	−0.025	0.002	−0.087	0.053	0.104
	(0.497)	(3.092)	(0.401)	(3.091)	(6.266)	(4.659)
Ages [50,55]	−0.006	−0.229	−0.037	−0.389	0.011	−0.183
	(2.450)	(6.011)	(2.162)	(6.873)	(0.881)	(4.069)
No. children <7	−0.001	−0.008	0.006	−0.009	0.001	−0.014
	(0.808)	(2.792)	(1.202)	(0.950)	(0.086)	(−0.656)
No. children [7,18]	0.001	0.004	0.002	0.018	0.003	−0.005
	(2.098)	(3.034)	(0.995)	(3.444)	(0.451)	(0.403)
Junior school	0.001	0.014	0.009	0.044	0.029	0.056
	(1.737)	(6.220)	(3.254)	(7.108)	(3.974)	(3.133)
High school	0.001	0.018	0.012	0.062	0.048	0.144
	(1.614)	(7.301)	(4.337)	(10.357)	(6.697)	(9.192)
Technical school	0.003	0.019	0.011	0.068	0.034	0.173
	(3.187)	(8.925)	(4.385)	(13.756)	(6.151)	(17.344)
Junior college	0.001	0.017	0.008	0.060	0.039	0.178
	(1.142)	(8.558)	(2.936)	(12.296)	(5.849)	(14.710)
>=University	0.002	0.017	0.003	0.047	0.011	0.083
	(2.899)	(9.080)	(0.819)	(9.953)	(1.186)	(4.649)
Party	0.003	0.013	0.015	0.042	0.014	0.063
	(3.218)	(7.112)	(5.917)	(8.605)	(2.672)	(5.219)
Minority	0.001	0.001	0.006	0.004	0.011	−0.011
	(0.488)	(0.255)	(1.927)	(0.337)	(1.231)	(0.409)
Married			0.040	0.104	0.046	0.061
			(2.41)	(3.660)	(2.108)	(1.748)
Other marriage			−0.022	0.026	−0.044	0.041
			(1.25)	(2.100)	(1.363)	(1.298)
HuKou city					0.013	0.036
					(0.552)	(1.064)
Log Likelihood	−523	−1304	−842	−1681	−1506	−2736
Pseudo R2	0.25	0.48	0.23	0.35	0.23	0.28
Observations	8539	8782	6320	6674	6344	6782

The determinants of unemployment and labour force participation rate in China are age, education, communist-party membership and marital status are significantly associated with participation in the labor force and employment opportunities. The rates of return to all level of education are higher for women than men in all three years. Each additional children between seven & eighteen, associated with higher point of employment (low unemployment). Men's labour force participation rate and employment rate are higher than women. The number of children present in family makes no difference for the employment probability 1995. As found in the literature on the issue, the gender inequalities still persist in China.

Conclusion

To conclude, this review has shown that there exists a long-run relationship between unemployment and labour-force participation in Sweden and United State. The result is robust and also found when using gender-specific data. The results also show that the unemployment invariance hypothesis has not found support in Sweden and United state. There are discouraged workers effects especially for men in Sweden and United State. High and sustained economic growth in China for the past 30 years has rapidly raised the standard of living of Chinese people. The fast economic development accompanied

by increasing in unemployment rates and decreasing in labour force participation rate in China. Age, education, communist party membership & marital status significantly associated with participation rate & employment opportunities. Little observed male-female differentials are attributable to differences in characteristics because gender inequalities still exist in China.

Table 5
Logit analysis of the probability of employment, marginal effects.

	1995		2002	
	Men	Women	Men	Women
Ages [25,29]	0.003	0.004	0.023	0.034
	(3.242)	(1.709)	(5.344)	(2.914)
Ages [30,34]	0.004	0.013	0.017	0.043
	(3.173)	(4.908)	(2.516)	(3.328)
Ages [35,39]	0.007	0.014	0.026	0.055
	(4.058)	(4.956)	(3.534)	(4.365)
Ages [40,44]	0.006	0.020	0.025	0.062
	(3.415)	(5.668)	(3.218)	(5.088)
Ages [45,49]	0.007	0.016	0.028	0.064
	(4.142)	(6.140)	(3.757)	(5.405)
Ages [50,55]	0.006	0.015	0.029	0.078
	(3.836)	(6.499)	(4.284)	(10.753)
No. children <7	0.000	0.001	0.035	0.017
	(0.068)	(0.172)	(3.600)	(1.384)
No. children [7,18]	−0.001	0.000	0.018	0.023
	(1.206)	(0.063)	(3.300)	(2.819)
Junior school	0.002	0.009	−0.007	0.028
	(1.259)	(2.787)	(0.547)	(2.238)
High school	0.004	0.013	0.008	0.049
	(2.449)	(4.197)	(0.788)	(3.887)
Technical school	0.006	0.014	0.025	0.078
	(3.831)	(5.377)	(3.610)	(9.956)
Junior college	0.006	0.016	0.032	0.104
	(3.734)	(6.350)	(4.151)	(11.341)
>=University	0.007	0.013	0.047	0.089
	(4.495)	(6.084)	(9.913)	(15.118)
Party	0.006	0.013	0.035	0.063
	(3.428)	(4.268)	(6.660)	(7.470)
Minority	−0.000	0.001	−0.024	−0.001
	(0.197)	(0.288)	(1.757)	(0.037)
Married	0.012	0.004	0.061	−0.004
	(2.023)	(0.955)	(3.066)	(0.237)
Other marriage	0.000	−0.010	0.009	0.036
	(0.132)	(0.723)	(0.691)	(1.929)
HuKou city			−0.017	0.019
			(1.476)	(1.246)
Log Likelihood	−491	−650	−1251	−1630
Pseudo R2	0.29	0.17	0.18	0.12
Observations	6058	5802	5758	5092

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