Selection and Real wage cyclicality: Germany Case

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Abstract

This paper examines the selection biases in the cyclical behaviour of real wages using the German Socio-Economic Panel Data (GSOEP) for the 1984-2009 period. We find rigid wages of job stayers in Germany.

Keywords: Selection; Wage cyclicality; Panel data

JEL classification: C33; C52; E32; J31

[☆]The German Socio-Economic Panel Data (GSOEP) is used with the permission of the German Institute for Economic Research (DIW Berlin). Neither the original collectors of the data nor distributors bear any responsibility for the analyses or interpretations presented here. All remaining errors are our own.

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1. Introduction

Accounting for selection affects measures of wage adjustment over the business cycle (Bils, 1985). Low-wage persons drop out of the workforce in recessions, and they return to it in booms. Hence, the aggregate wage statistics used to only measure (employed) workers' wages, and exhibit "too little variability" over the business cycle because changing composition partially offsets measured wage cyclicality (Heckman, 2001; Heckman and Sedlacek, 1985).

Micro panel data have the advantage of removing compositional biases from the wage measure using wage differencing approach (Solon et al., 1994). However, restricting the sample only to those who report wages for two consecutive survey years may have selection biases if the probability of employment in two consecutive years is not random in the workforce (Heckman, 1979; Solon, 1988). Thus, Solon et al. (1994) argue that the cyclical wage effects of composition would not be accounted for by the differencing approach provided that the sample distribution of those composition factors is related to business cycle conditions.

This paper examines the selection biases in the wage differencing approach of real wage cyclicality using micro panel data for Germany for the 1984-2009 period. Germany had a rigid labour market (Anger, 2011) which forms an instructive contrast with the more flexible economies such as the US (Devereux, 2001) and the UK (Devereux and Hart, 2006). Our aim is to provide a factual basis for inquiry, using micro panel data from the German Socio-Economic Panel Data (GSOEP).

2. Data and econometric methods

The GSOEP data used in this study were a wide-ranging representative longitudinal study of private households. The same private households, persons and families have been surveyed yearly since 1984 (the GSOEP West), starting with about 16,000 respondents. In June 1990, the survey was extended to the territory of the former German Democratic Republic (the GSOEP East)[1]. Our empirical work combines the two-step OLS estimation procedure, beginning with Solon et al. (1997) with the traditional Heckman selection model (Heckman, 1976, 1979). Solon et al.'s (1997) procedure is designed to get round the Moulton (1986) problem in the study of real wage cyclicality that, though we have thousands of individuals, each year provides only one business cycle (in our case, regional unemployment) observation. However, this method assumes a random selection of workers who are employed in two consecutive years, that is, no selection biases. To circumvent this problem, in step 1 and step 2 we estimate a Heckman selection model for wage changes using individual data. The first equation is given by:

$$ln\frac{w_{it}}{w_{i,t-1}} = \alpha_0 + \alpha_1 Age_{it} + \alpha_1 Ten_{it} + \sum_{t=1}^{T} s_t Y_t + \sum_{t=1}^{T} w_t M_{Wit} Y_t + \sum_{t=1}^{T} b_t M_{Bit} Y_t + u1_{it} \qquad (1)$$

where w_{it} is the real hourly wage rate of individual *i* in year *t*, Age_{it} is a cubic in age, Ten_{it} is a cubic in tenure, Y_t denotes a year dummy, and $u1_{it}$ is a random error term. A further advantage of the panel data of the GSOEP is that we can follow the distinction between

[1] Though the GSOEP East actually started in 1990, there is no employment information for workers in 1990 and 1991. Thus, our data for the East Germany is actually for the period of 1992-2009.

job stayers (remaining in the same job over the years), internal movers (i.e., within-company movers), and external movers (i.e., between-company movers). While job stayers are the most important numerically, internal movers bumping up and down internal company job ladders (Reder, 1955) provide further flexibility even if wages for stayers are rigid. Furthermore, as regards external movers, wages are likely to be yet more procyclical, since their wages will be more dependent on spot market conditions (Beaudry and DiNardo, 1991). M_{Wit} denotes a dummy variable for internal movers, and M_{Bit} is a dummy variable for external movers. This step gives us a time series of wage changes for the stayers, s_t; for the within-company movers, w_t; and for the between-company movers, b_t.

And then, we examine the relation between workers' characteristics and the employment probability over two consecutive years by testing vector of coefficients γ in the probit estimates of the selection equation:

$$Pr(employed\ in\ two\ consecutive\ years|\ X_{it}) = \Phi(X_{it}\gamma) + u2_{it} \qquad (2)$$

Probability of employed in two consecutive years is given by cubic age, 5 education dummies, marital status and all year dummies (X_{it}). Residual errors of two equations (1) and (2) follow normal distribution with mean 0 and standard deviations of σ and 1, and are correlated each other: $u1 \sim N(0; \sigma)$; $u2 \sim N(0; 1)$; $corr(u_1; u_2) = \rho$. When $\rho \neq 0$, standard OLS regression applied to equation (1) yield biased results. And then, from these estimates, the non-selection hazard what Heckman (1979) referred to as the inverse of the Mills' ratio, m_{it} for each observation is computed as $m_{it} = \frac{\varphi(X_{it}\hat{\gamma})}{\Phi(X_{it}\gamma)}$, where φ is the normal density. The Heckman adjusted parameters of equation (1) are estimated by

augmenting the regression equation with the non-selection hazard m_{it}. We also test the selectivity effect λ (=ρσ) to justify the Heckman selection model.

In step 3, we then derive estimates of the wage cyclicality of stayers by regressing s_t on the unemployment change variable[2] and a linear time trend. In this step, we only have time series variation, reducing the number of observations – in our case 25 years for West Germany (1984-2009), 17 years for the East Germany (1992-2009). The time series is enough to cover more than one full business cycle in Germany (Kang and Peng, 2012; Shin, 1994). We use weighted least squares where the weights are the numbers of individuals observed in a given year. This equation is given by:

$$\hat{s}_t = \delta_0 + \delta_1 \Delta u_{t-1} + \delta_2 Year_t + \nu_t \tag{3}$$

Alternatively, using $\hat{w}_t$ in equation (3), the coefficient on Δu_{t-1} gives the incremental wage response of within-company movers relative to stayers. Similarly, by using $\hat{\delta}_t$ as the dependent variable we can derive the incremental wage response of between-company movers relative to stayers.

3. Empirical results

The OLS results for the unemployment change coefficients from equation (1) and (3) are reported in the upper panel of Table 1, for the East and West separately. The estimated total wage cyclicality is negative and significant for both male and female job stayers in West Germany. One point increase of the regional unemployment rate could decrease the real wage by 0.818% for males and 0.629% for females. Moreover, internal

[2] We lag unemployment change variable one year using Δu_{t-1} (Ammermüller et al., 2010).

male movers and external female movers show more procyclicality, as might be expected by Pissarides (2009). One point increase of the regional unemployment rate could decrease the real wage by about 2.6% (=0.818%+1.737%) for male internal movers and 3.2% (=0.629%+2.529%) for female external movers. In the East, however, coefficients of stayers are much lower and insignificant than those in the West, and there is no sign of extra procyclicality for movers. Insensitive responses to business cycle are consistent with a transitional labour market in the East.

Table 1 Wage and unemployment changes by gender and region (coefficients on Δu_{t-1} from equation 3)

OLS	West (1984-2009)		East (1992-2009)	
	Male	Female	Male	Female
Job stayers	-0.818**	-0.629*	-0.276	-0.343
	(0.35)	***(0.326)***	***(0.274)***	***(0.349)***
Internal movers	-1.737*	0.108	-0.141	-0.791
	(0.989)	***(1.324)***	***(1.274)***	***(1.706)***
External movers	-0.721	-2.529**	-0.478	0.213
	(0.844)	***(1.026)***	***(1.318)***	***(1.29)***
Observation No.	85,318	61,616	18,383	16,190

Heckman	West (1984-2009)		East (1992-2009)	
	Male	Female	Male	Female
Job stayers	-0.154	-0.267	-0.573	-0.203
	(0.699)	***(0.437)***	***(0.433)***	***(0.53)***
Internal movers	-1.892*	0.084	1.046	-0.675
	(1.048)	***(1.307)***	***(1.372)***	***(1.719)***
External movers	-1.420*	-2.364**	-0.286	0.339
	(0.763)	***(1.048)***	***(1.294)***	***(1.242)***
Mills				
Selectivity effect ($\lambda=\rho\sigma$)	21.19***	9.70**	8.61	-7.37
	(2.80)	***(4.51)***	***(5.62)***	***(5.05)***
Observation No.	99,129	75,899	22,923	20,825

Notes: Standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10% levels for two-tail tests. 2% extreme cases of wage changes are dropped. There are 25/17 region-wide weighted observations for the West/East in the third stage. Unemployment rates are from the Labour Force Survey (LFS)-Germany. Wage is deflated by regional CPI, also provided by the Federal Statistics Office (FSO).

Next, we present Heckman corrected results in the bottom panel. Significant procyclicality of job stayers in the West is gone as in Anger (2011), suggesting strong selection biases. Hence, the flexible hourly wages of job stayers in the OLS could be a consequence of dropping respondents from the sample of employment in two consecutive years, i.e. selection biases. It is confirmed by the highly significant selectivity effects ($\lambda=\rho\sigma$) for both males (21.19) and females (9.7) in the West. The incremental procyclicality of movers are more prominent than in the OLS. Even if wages for stayers are rigid, internal job ladders provide further flexibility for male workers (Reder, 1955). Wages of external movers are likely to be yet more procyclical for both males and females (Beaudry and DiNardo, 1991; Pissarides, 2009). Furthermore, there is no significant selectivity effect in the East. Results of Heckman model are also always insignificant in the East.

4. Conclusions

This paper finds strong selectivity effects on real wage cyclicality in West Germany, but not for the East. The results suggest that the flexible hourly wages in the West may be from the selection biases of wage differencing approach. Heckman adjustment shows that wages of job stayers in the West are insensitive to the business cycle while the incremental effects of movers are significantly procyclical. Less employment chances and lower wages of movers may be the main channels to alleviate the pressure of adverse shocks of economy in the West. And, neither job stayers nor movers have flexible wages in the East, that is, a more rigid labour market.

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