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ABSTRACT

Workers' Flows and Real Wage Cyclicality*

This study investigates real wage cyclicality in Portugal for the years of 1986-98, addressing the heterogeneity in wages responses to aggregate labor market conditions for workers' hirings and separations. The results exhibit a moderate procyclical behavior of real wages for continuously employed workers, in particular, for job stayers. For workers' accessions a strongly procyclical behavior in wages was observed, which is consistent with the idea that entry wages are much more procyclical than current wages. This empirical evidence suggests that even micro-data estimates of real wage cyclicality may conceal a strong procyclical wage behavior, when heterogeneity on wages responses to aggregate conditions between employed workers and hirings and separations is not taken into account.

JEL Classification: D21, J30, J31

Keywords: wage cyclicality, hirings, separations

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1 Introduction

The cyclical behavior of real wages has been the subject of a large number of studies since the debate of Keynes (1939), Dunlop (1938), and Tarshis (1939). However, despite considerable research on this issue, the same vexed questions remain to be solved. Are real wages countercyclical or procyclical? Flexible price-aggregate demand models predict that real wages should move countercyclically as employment adjusts along a negatively sloped aggregate demand for labor schedule. Real business cycle models, on the other hand, predict procyclical movements as workers substitute work for leisure along dynamic labor supply schedules.

Brandolini (1995) presents an exhaustive literature review of the studies on real wage cyclicality published from the 1920s onwards. Abraham and Haltiwanger (1995) also present a review of the empirical evidence on real wage cyclicality, stressing the issue of the sensitivity of the results to the measurement of nominal wages, nominal prices, and cyclical conditions, as well as to frequency, time period, and econometric specification.

The studies based on aggregate data show some ambiguous results. In this case, the best conclusion is that the choice of the time period analysis, price deflator, and cyclical indicator, as well as the choice between wage rates and average earnings (including overtime or not), may substantially affect the estimates of real wage cyclicality [Abraham and Haltiwanger (1995)].

One reason why these studies have reached no definitive conclusions resides in the fact that they have been performed at the aggregate level. In particular, they have ignored the changes in the composition of the workforce over the cycle. The presence of compositional effects has attracted much attention in the last years and recent micro-data studies based on panel data for the U.S. showed that composition bias plays an important role on real wage behavior along the business cycle [see, for example, Mitchell *et al.* (1985), Bils (1985), Keane *et al.* (1988) and Solon *et al.* (1994)]. In fact, cyclical changes in the composition of the work force may induce a countercyclical bias in the aggregate real wage. Aggregate measures of real wages tend to give more weight to low-skill workers during expansions than during recessions. The argument is that if less-skilled workers are more vulnerable to layoff, they will account for a smaller share of employment in recessions than in expansions.

As stated in Blundell *et al.* (2000), "Aggregate figures for real wage growth are used extensively in policy debate to analyze changes in the well-being of workers over time and to compare different groups of people both within and across countries. However, if participation (employment) rates change across time periods or across the groups used in these comparisons, then aggregate real wages may give a misleading impression of changes in the structure of real wages facing individual workers." According to them, aggregate real wages are shown to contain three important bias terms: one that describes the dispersion of wages, the second reflecting the distribution of working hours, and the third captures the effects of composition changes in the selected sample of workers. Using data from the U.K. Family Expenditure Survey (FES) from 1978 to 1996,

they have shown that those three terms play an important role in explaining the differences between individual and aggregate wages in Britain.

An additional general problem of aggregation is that it assumes that the relationship between real wages and the business cycle is the same for all individuals or groups of individuals. If wrong, the estimates of real wage cyclicality include a specification bias.

In the last two decades, a number of studies based on micro-panel data for the U.S. found, without exception, robust evidence in favor of a procyclical behavior of real wages. Recently, the focus of micro-data studies on wage cyclicality has been the differences in individual real wage responses to aggregate labor market conditions for different types of workers classified by demographic characteristics, job mobility status, industry, type of payment, etc. The aim of our own study is to investigate real wage cyclicality in Portugal for the period 1986-98, addressing the issue of heterogeneity in wage responses to aggregate labor market conditions for workers' hirings and separations. For this purpose a micro-longitudinal panel data obtained from *Quadros de Pessoal (QP)* will be used. *QP* is an annual mandatory employment survey collected by the Portuguese Ministry of Employment. It covers almost all establishments with wage earners. Reported data cover the establishment itself, the firm and each of its workers. Since unique identifiers are available for both firms and workers, firms and individuals can be tracked over the sample period. Currently, the data set collects data on about 250,000 firms and 2,5 million employees.

Our paper is related in at least two distinct ways to the recent micro-data studies on wage cyclicality. First, it confirms the empirical evidence of a procyclical behavior of real wages, even for a European country which has a very different labor market institutional framework than the U.S. Second, it addresses the issue of heterogeneity in wage responses to unemployment for workers' accessions and separations, showing that examining wage cyclicality of employed workers without taking into account the flows of workers into and out of the workforce may mask the estimates of real wage cyclicality.

This study will be organized as follows. In the next Section a brief literature review of previous research on real wage behavior over the business cycle is presented. In Section 3 some selected labor market indicators for Portugal are reported. In Section 4 the data set and methodology are described. The empirical framework and main results are discussed in Section 5. Conclusions are outlined in Section 6.

2 Previous Research

In this section a very brief description of the empirical literature on the movements of real wages over the cycle will be made.[1] These empirical studies can be classified in two groups, according to whether aggregate or micro-panel data are used.

[1] For a insightful survey see Brandolini (1995).

2.1 Studies using Aggregate Data

Over the last 60 years economists have been discussing real wage behavior over the cycles. Neoclassical and Keynesian models predicted that real wages behave countercyclically, since an increase in employment can only occur with a decrease in real wages.[2] However, in the presence of imperfect competition, uncertainty, lagged responses, or contracting between firms and workers, there are few reasons to expect this behavior [Brandolini (1995)]. The macroeconomic disequilibrium model of Barro and Grossman (1971), for instance, provided a theoretical explanation for the possibility of procyclical real wages. They show that the impact of excess supply of commodities on labor demand removes the one-to-one classical relationship between real wage and employment. In a general disequilibrium situation, unemployment can coexist with "non-excessive" real wages, and a procyclical pattern of real wages is consistent with the theoretical model. On the other hand, implicit contract theory predicts the existence of acyclical real wages [see Rosen (1985) for a survey]. According to this theory, contract wages embody implicit payments of insurance premiums by workers in favorable states of nature and receipt indemnities in unfavorable states, meaning that wages are somewhat insulated from current labor market conditions.

The empirical work tried to shed some light on these alternative explanations. In fact, it is worth noting that the establishment of a stylized fact concerning the typical wage pattern over the cycle is purely an empirical matter.

Several studies using aggregate data appeared in the 1970s and 1980s with the aim of analyzing the movements of real wages over the business cycle. The focus of these studies was the raw correlation between real wages and employment or output (or another cyclical indicator). In this sense, real wages are acyclical when they are uncorrelated with the variable chosen as indicator of the business cycle.

Despite the use of appropriate econometric techniques and representative data sets, the conclusions reported in these studies were mixed and inconclusive. Indeed, studies by Chirinko (1980), Canzoneri (1978), Tatom (1980), Neftci (1978), Sargent (1978), and Mehra (1982) provide evidence of countercyclical real wages. However, Bodkin (1969) and Michie (1987) showed that real wages are procyclical. On their side, Geary and Kennan (1982) found evidence for 12 OECD countries in favor of the hypothesis that real wages and employment are statistically independent. Finally, Sumner and Silver (1989) concluded that real wages were either procyclical or countercyclical depending on the sample period chosen.

Table 1 displays a selected number of studies on real wage cyclicality based on aggegated data and the main results obtained concerning the correlation between real wages and the cyclical indicator.

[2] Quoting the General Theory [Keynes (1936), p. 17]: " ...with a given organization, equipment and technique, real wages and the volume of output (and hence of employment) are uniquely correlated, so that, in general, an increase in employment can only occur to the accompaniment of a decline in the rate of real wages. Thus I am not disputing this vital fact which the classical economists have (rightly) asserted as indefeasible. ...The real wage earned by a unit of labor has a unique inverse correlation with the volume of employment."

Table 1: Studies of Real Wage Cyclicality that Use Aggregate Data

Author	Country	Sample	Cyclical Indicator	Real Wage/Cyclical Indicator Correlation	Remarks
Bodkin (1969)	U.S.	Manufacturing data quarterly (annual); 1900-65	Unemployment rate	negative, significant	
	Canada	Manufacturing data quarterly (annual); 1921-65	Unemployment rate	not significant	
Otani (1978)	14 Industrial countries	Manufacturing data annual; 1952-75	Index of industrial production	negative, significant in 6 of the 14 countries	
Chirinko (1980)	U.S.	Manufacturing data annual; 1955-75	Index of industrial production	negative, significant	account for compositional changes in the workforce
Canzoneri (1978)	Canada	Manufacturing data quarterly; 1954-70	Worked hours per capital unit	negative, significant	account for the level of capital stock
Tatom (1980)	U.S.	Private business sector annual; 1948-73	Worked hours per capital unit	negative, significant	account for the cyclical variation of utilization of the capital stock
Neftci (1978)	U.S.	Manufacturing data monthly; 1948-71	Production workers in manufacturing	negative, significant	introduced dynamic analysis
Sargent (1978)	U.S.	Manufacturing data quarterly; 1948-72	Production workers in manufacturing	negative, significant	introduced dynamic analysis

Table 1: Continued

Author	Country	Sample	Cyclical Indicator	Real Wage/Cyclical Indicator Correlation	Remarks
Geary and Kennan (1982)	12 OECD countries	Manufacturing data quarterly; 1947-77	Employment in manufacturing	no correlation for the 12 countries[a]	[a]employment and real wages are statistically independent
Sumner and Silver (1989)	U.S.	Manufacturing data annual; 1900-85	Total employment in manufacturing	negative and positive depending on the sample period	
Mehra (1982)	U.S.	Manufacturing data[b] quarterly; 1956-70	Production workers in manufacturing	negative, significant in 9 of the 14 industries	[b] disaggregated by industry at the two digit level
Burda (1985)	U.S.	Manufacturing data[b] annual; 1949-78	Total worked hours	inconclusive	[b] disaggregated by industry at the two digit level
Michie (1987)	U.K.	Manufacturing data[b] annual; 1948-74	Industry output	positive, significant in all industries except one	[b] disaggregated by industry at the two digit level

2.2 Studies using Micro-data

Empirical studies on real wage movements that use micro-panel data began to appear in the mid 1980s. The authors of these studies realized that the changes in the composition of the workforce over the cycle may affect the behavior of aggregate wages, inducing a bias. The usual argument is that less skilled workers are more vulnerable to layoffs in a period of recession. Thus, in periods of business cycle recession real wages are probably averaged over a group of workers with higher wages than those averaged in a period of business cycle expansion, imposing a countercyclical bias. Bils (1985) and Mitchell *et al.* (1985) were the first to explicitly address the effects of using aggregate data on the estimates of real wage cyclicality.

Using two different data sets, the National Longitudinal Survey (NLS) and the Panel Study of Income Dynamics (PSID), these studies point quite decisively toward a procyclical behavior of real wages.[3] Concerning the sign of the composition bias, the results were not so conclusive. Those studies that used the PSID data concluded that aggregation induces a countercyclical bias. The studies using the NLS data showed a relatively unimportant countercyclical composition bias (Bils, 1985) or a procyclical one (Keane *et al.*, 1988).

Recently, the main focus of these studies has been the differences in individual real wage responses to aggregate labor market conditions for different types of workers classified by demographic characteristics, job mobility status, industry, type of payment, etc. Solon *et al.* (1994) and Shin (1994), for example, analyzed the heterogeneity in real wage responses over the cycle between job changers and job stayers. After Bils' (1985) finding that wages are strongly procyclical only among job changers, these authors have reported evidence of considerable real wage procyclicality even for job stayers. Tremblay (1990) and Solon *et al.* (1994) analysed the cyclicality of wages by gender, showing that women's real wage are much less procyclical than men's real wage. Ziliak *et al.* (1999) investigate how real wages respond to local and aggregate unemployment over time for different groups of workers classified according to education, race, industry, occupation and union status. Overall, they found spatial and timing differences in the cyclicality of real wages as well as substantial heterogeneity in wage behavior over the cycle across different groups of workers. Grant (2001) compares the cyclical behavior of union and nonunion wages in the U.S., concluding that substantial reductions in union wage procyclicality since the mid-1980s are associated with reductions in the procyclical exercise of bargaining power. Devereux (2001) provides a detailed analysis of the wage cyclicality of stayers, taking into account the different types of payment. Taken as a whole, his results revealed that incentive pay is much more sensitive to the business cycle than are wage rates or salaries.

In Tables 2 and 3 a synthesis of the methodology and main empirical results of the U.S. micro-data studies is provided. Table 2 refers to the studies that used the NLS data and Table 3 refers to the studies that used the PSID data.

[3] Meghir and Whitehouse (1996) used data on male employees for the U.K. and also showed that real wages are highly procyclical.

Table 2: Studies of Real Wage Cyclicality that Use Micro-data
National Longitudinal Survey (NLS)

Author	Sample	Model and Estimation Method	Wage Measure	Cyclical Estimates (aggregate unemployment rate)
Bils (1985)	young men 1966-80 11 spells	first differences (GLS)	weekly earnings, including overtime, divided by weekly hours (GNP deflator)	$\beta = -1.59$ (whites) $\beta = -0.64$ (job stayers) $\beta = -3.69$ (job changers)
Keane *et al.* (1988)	young men 1966-81 12 spells	random effects (maximum likelihood (ML))	hourly straight-time earnings (CPI deflator)	$\beta = -0.96$ (OLS) $\beta = -0.66$ (ML)
Tremblay (1990)	young women/men 1968-78 9/8 spells	fixed effects (OLS)	hourly wage (CPI deflator)	$\beta = -0.90$ (white women) $\beta = -1.50$ (white men)
Shin (1994)	young men 1966-81 12 spells	first differences (OLS)	annual earnings divided by annual hours (GNP deflator)	$\beta = -1.65$ (whites) $\beta = -1.18$ (job stayers) $\beta = -2.67$ (job changers)

Table 3: Studies of Real Wage Cyclicality that Use Micro-data
Panel Study of Income Dynamics (PSID)

Author	Sample	Model and Estimation Method	Wage Measure	Cyclical Estimates (aggregate unemployment rate)
Raisian (1983)	men aged 65 or less 1967-79 13 spells	fixed effects (OLS)	total annual labor income excluding income from extra jobs, divided by weeks worked (CPI deflator)	$\beta = -0.65^*$ * industry unemployment rate
Solon *et al.* (1994)	men/women aged 16 plus 1967-87 21 spells	first differences (OLS)	annual earnings divided by annual hours (GNP deflator)	$\beta = -1.40$ (men) $\beta = -0.53$ (women) $\beta = -1.24$ (men stayers)
Ziliak *et al.* (1999)	men aged 20-65 1971-90 20 spells	fixed effects (FE) first differences (FD) (OLS)	annual earnings divided by annual hours (personal consumption expenditure deflator)	$\beta = -1.31$ (FE) $\beta = -1.15$ (FD)
Devereux (2001)	men aged 18-64 1970-91 22 spells	first differences (OLS)	annual earnings divided by annual hours (personal consumption expenditure deflator)	$\beta = -1.16$ (full sample) $\beta = -0.81$ (job stayers) $\beta = -0.54$ (job stayers with no extra jobs)

3 Some Selected Labor Market Indicators

3.1 Labor Force Participation and Unemployment

Table 4 and Figures 1 and 2 display the evolution of the unemployment and participation rates over the period 1985-98.[4]

The national unemployment rate is obtained from the Labor Force Survey of the *Instituto Nacional de Estatística (INE)*. As can be seen, the period 1985-98 comprises the 1985-92 expansion and the 1993-96 recession. In fact, the unemployment rate reached its peak in 1985 at 8.5%. Since then its evolution has accompanied the economic expansion of the mid-1980s, so that it steadily decreased until 1992. By this time, the Portuguese labor market experienced a situation of near full employment. However, due to the recession initiated in 1993, unemployment rates rose, averaging 7.3% in 1996.

In the mid-1980s and the early 1990s the proportion of female unemployment was much higher than the proportion of male unemployment (see Table 4). Since then, male and female unemployment shares have been very similar, albeit slightly higher for women.

Over the 1985-98 period the participation rate seems to exhibit a procyclical behavior. The evolution of male activity rates over this period is mainly the result of a declining participation of younger (less than 24 years) and older (50-64 years) men, and an almost unchanged participation behavior for men in the 24-50 years group. In its turn, the rise in female participation is the result of a long-term trend mainly explained by changing life styles and family strategies concerning participation in the labor market. Portugal exhibits one of the highest rate of female participation in the labor force in the European Union.

[4] It should be noted that in 1992 and 1998 there is a series break, implying that the results are not directly comparable with the previous year.

Figure 1: Unemployment Rate, Portugal 1985-98

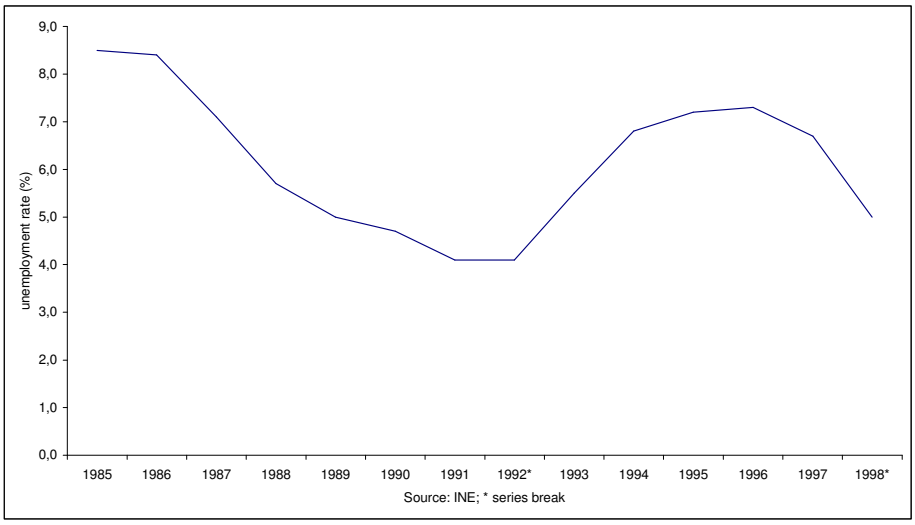
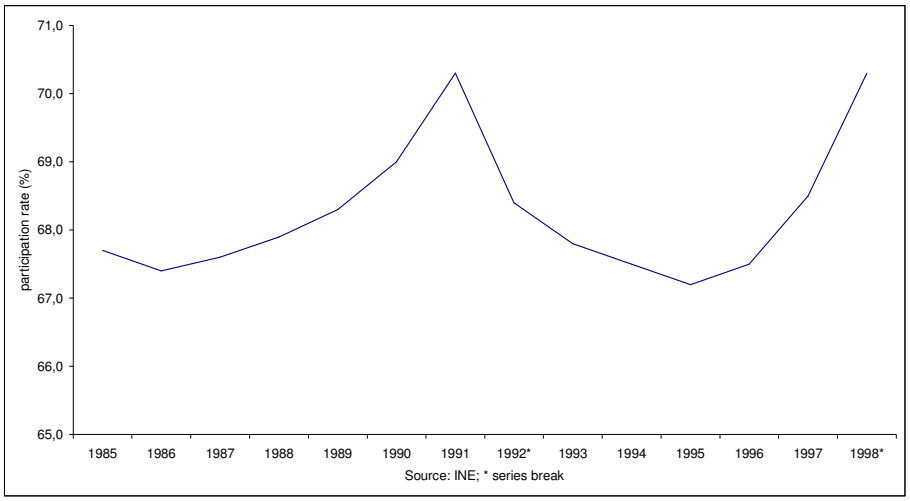


Table 4: Unemployment and Participation Rates
Portugal, 1985-98

	Unemployment Rate (%)			Participation Rate (%)[a]		
Year	All	Male	Female	All	Male	Female
1985	8.5	6.3	11.4	67.7		
1986	8.4	6.5	11.1	67.4		
1987	7.1	5.4	9.5	67.6	80.0	55.6
1988	5.7	4.1	8.0	67.9	79.9	56.7
1989	5.0	3.4	7.1	68.3	80.4	57.2
1990	4.7	3.2	6.6	69.0	80.5	58.2
1991	4.1	2.8	5.8	70.3	80.7	60.6
1992*	4.1	3.5	4.9	68.4	78.7	58.9
1993	5.5	4.7	6.5	67.8	77.2	59.0
1994	6.8	6.0	7.8	67.5	76.4	59.3
1995	7.2	6.4	8.0	67.2	75.4	59.4
1996	7.3	6.5	8.2	67.5	75.5	59.9
1997	6.7	6.1	7.6	68.5	76.4	61.1
1998*	5.0	4.0	6.2	70.3	78.6	62.4

Source: INE; * series break.
[a] Men and women aged 15-64 years.

Figure 2: Participation Rate, Portugal 1985-98



3.2 Real and Nominal Wages

In Tables 5 and 6 the evolution of nominal and real wages over the 1985-98 period is presented, using data from *Quadros de Pessoal* (*QP*). The *QP* data set includes all dependent workers, excluding public administration and non-market services.[5] The wages were deflated by the CPI (base=1985).

Table 5 provides information on annual rates of growth of average monthly base wages and average monthly earnings.[6] Portuguese nominal wages and earnings show an upward trend over the entire period 1985-98. The rates of growth, however, have decreased in recent years, keeping pace with inflation. In fact, in the 1990s a great effort was made by the government and social partners in order to reduce inflation and obey the convergence criteria of the Euro area (the figures for the inflation rate are shown in column 1 of Table 7).

According to Table 6, changes in real wages were also positive, except for the year of 1995. Whereas the 1989 fall in the rate of growth of real earnings was mainly attributable to a transitory failure in expectations following the setback in disinflationary policies, the 1994/95 decline stems from the recession that took place in 1993.

Table 7 provides the rates of change of nominal and real earnings for the whole economy. The inflation rate as measured by the CPI (excluding rent) for the mainland is also reported. The evidence for the entire economy displays essentially the same pattern.

[5] A detailed description of this data set will be presented in the next Section.

[6] The average monthly earnings include base wages, seniority payments and regular benefits.

Table 5: Nominal Monthly Base Wages and Earnings
Portugal, 1985-98

Year	Average Monthly Base Wages*	Percentage Change	Average Monthly Earnings*	Percentage Change
1985	24719.4		27526.2	
1986	29811.7	20.6	33239.9	20.8
1987	34242.3	14.9	38332.2	15.3
1988	37550.3	9.7	42341.8	10.5
1989	42582.4	13.4	47955.3	13.3
1990	n. a.	n. a.	n. a.	n. a.
1991	58179.9	n. a.	66319.4	n. a.
1992	66439.7	14.2	76985.1	16.1
1993	73797.4	11.1	84944.2	10.3
1994	80192.8	8.7	92943.5	9.4
1995	82518.4	2.9	95890.5	3.2
1996	87169.6	5.6	101744.6	6.1
1997	90557.7	3.9	106014.9	4.2
1998	94470.0	4.3	110825.1	4.5

Source: *QP*; 1986-93 March data; 1994-98 October data; n. a.: not available.
* in PTE (escudo): 1 EUR≡200.482 PTE.

Table 6: Real Monthly Base Wages and Earnings
Portugal, 1985-98

Year	Average Monthly Base Wages*	Percentage Change	Average Monthly Earnings*	Percentage Change
1985	24719.4		27526.2	
1986	26563.9	7.5	29631.2	7.6
1987	27786.8	4.6	31114.8	5.0
1988	28167.7	1.4	31756.3	2.1
1989	28428.3	0.9	32017.0	0.8
1990	n. a.	n. a.	n. a.	n. a.
1991	30693.8	n. a.	34984.1	n. a.
1992	32297.7	5.2	37409.9	7.0
1993	33420.3	3.5	38472.5	2.8
1994	33761.2	1.0	39134.1	1.7
1995	33360.2	-1.2	38773.2	-0.9
1996	34222.3	2.6	39956.1	3.0
1997	34924.0	2.0	40878.3	2.4
1998	35305.3	1.1	41417.6	1.3

Source: *QP*; 1986-93 March data; 1994-98 October data; n. a.: not available.
* in PTE (escudo): 1 EUR≡200.482 PTE.

Table 7: Percentage Changes of Prices and Earnings
Portugal, 1985-98

	Consumer Price Index[1]	Compensation per employee*[2]	
	Annual	Nominal	Real
Year	Percentage Change	Percentage Change	Percentage Change
1985	19.3		
1986	11.7		
1987	9.4	13.8	3.8
1988	9.6	11.6	0.7
1989	12.6	14.1	1.2
1990	13.4	17.6	4.9
1991	11.4	19.1	6.6
1992	8.9	13.8	3.9
1993	6.5	8.0	0.8
1994	5.2	5.5	-0.1
1995	4.1	7.1	2.9
1996	3.1	6.5	3.3
1997	2.2	5.8	3.5
1998	2.7	5.8	2.8

Sources: [1] INE; [2] Banco de Portugal (1999), *Annual Report 1998*.

* Estimates for the entire economy, annual basis. Employers' contributions to Social Security included. Private consumption deflator.

The standard measure of wages used in studies of the cyclical behavior of real wages is an hourly measure. Figure 3 displays the evolution of real hourly wages and earnings over the period 1985-98 using the *QP* data. Three measures of hourly wages were defined: average hourly base wages (AHBW), average hourly earnings (AHE) and average hourly earnings including overtime pay (AHEIOT).[7]

In real terms, average hourly base wages and average hourly earnings (with or without overtime pay included) exhibit a reasonably steady increase in the 1985-98 period. Between 1985 and 1998, AHE grew around 60% in real terms, which corresponds to an average annual growth rate of 4% (3.5% for hourly AHBW). The same is true when overtime pay is included. In fact, average hourly earnings including overtime pay (AHEIOT) present an evolution pattern quite similar to AHE. This is mainly due to the fact that in this period overtime hours represent, on average, only 0.9% of total hours worked, giving rise to an almost coincidence of values between AHEIOT and AHE.

Figure 4 displays the rates of growth of real and nominal hourly base wages and earnings. Independently of the wage measure used (base wages or earnings), real and nominal wage growth rates present a similar pattern over the period 1985-98.

However, when these results are compared to those obtained for monthly base wages and earnings (see Table 6), some differences emerge in the evolution of the rates of growth of real wages and earnings regardless of whether an hourly or monthly measure is used. In 1994, for example, even though the rate of growth of real monthly wages and earnings decreased, a reduction in the total number of usual hours worked contributed to a higher growth in real hourly wages/earnings.

[7] AHE equals the ratio of total regular payroll to total normal hours and AHEIOT is defined as the ratio between total regular payroll including overtime pay and the sum of normal and extra hours of work. Total regular payroll includes base wages, seniority payments and regular benefits.

Figure 3: Real Wages, Portugal 1985-98

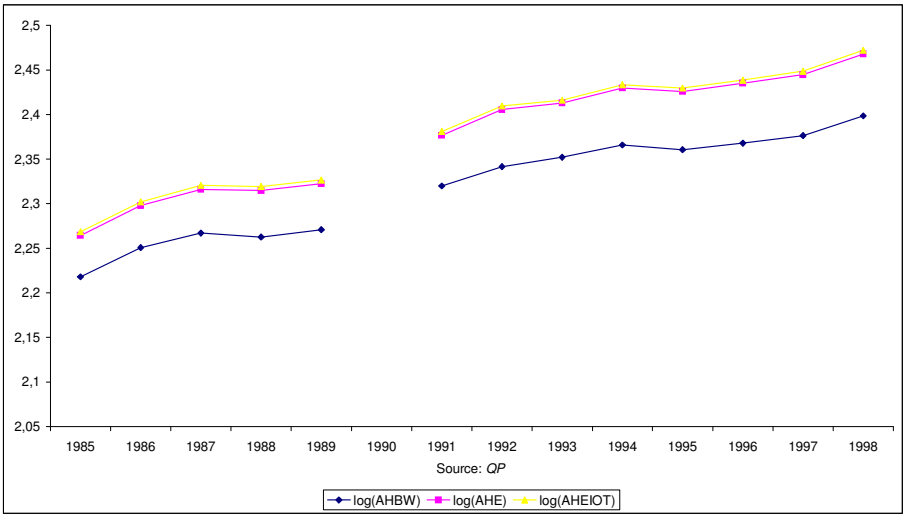
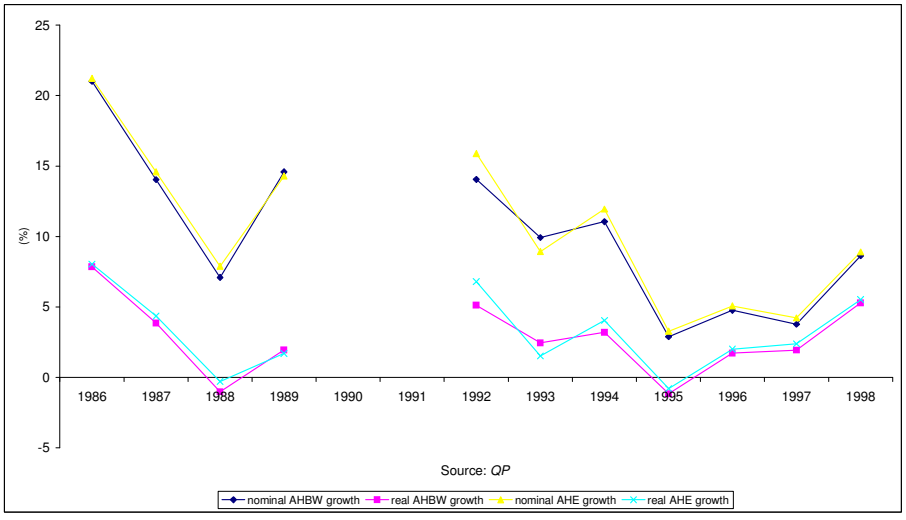


Figure 4: Real and Nominal Wage Growth, Portugal 1985-98



4 Data and Methodology

4.1 Data Description

The data sets of this study were constructed using the data from *Quadros de Pessoal* (*QP*). *QP* is an annual mandatory employment survey collected by the Portuguese Ministry of Employment, that covers virtually all establishments with wage earners.[8] Indeed, each year every establishment with wage earners is legally obliged to fill in a standardized questionnaire. Reported data cover the establishment itself (location, economic activity and employment), the firm (location, economic activity, employment, sales and legal framework) and each of its workers (gender, age, education, skill, occupation, tenure, earnings and duration of work). The information on earnings is very complete. It includes the base wage (gross pay for normal hours of work), seniority payments, regular benefits, irregular benefits and overtime pay, as well as the mechanism of wage bargaining. Information on normal and overtime hours of work is also available.

Twelve spells of *QP*, from 1986 to 1998, were available for this study.[9] From 1986 to 1993 the information was collected in March of each year, and since 1994, in October.

There are three main reasons that make this survey a good source for the study of wage cyclicality. The first is its coverage. By law, the questionnaire is made available to every worker in a public space of the establishment. This requirement facilitates the work of the services of the Ministry of Employment that monitor compliance of firms with the law (e. g., illegal work). Indeed, the administrative nature of the data and its public availability implies a high degree of coverage and reliability. Second, this survey is conducted on a yearly basis, and its identifying scheme allows accurate identification of workers making it possible to track them over the years. The workers' identification number is based on a transformation of his/her social security number. Finally, this source enables the matching of firms and its workers, which allows us to classify the situation of the worker on the job (stayer/changer, accession/separation). Each firm entering the database is assigned a unique identifying number and the Ministry implements several checks to ensure that a firm that has already reported to the database is not assigned a different identification number.

Naturally, this data source also has its own limitations. The most important one for the purpose of analyzing wage cyclicality is the short time period covered (1986-98, excluding 1990).

Table 8 reports information on the number of firms and workers covered by *QP* in each year of the 1986-98 period.

[8] Public administration and non-market services are excluded.

[9] No computer files are available for the year 1990.

Table 8: Data Set Coverage
Quadros de Pessoal, 1986-98

Year	Number of Firms	Number of Workers
1986	106770	1897785
1987	110865	1936801
1988	122775	1996802
1989	137155	2169835
1990	140333	n.a.
1991	148602	2233237
1992	159192	2268151
1993	165876	2215481
1994	184306	2202609
1995	192270	2232548
1996	197558	2233721
1997	213589	2350782
1998	224456	2430691

Note: n. a. denotes not available.

4.2 Methodology

As explained above, micro-data allow us to avoid the consequences of composition bias that might contaminate the results when aggregate data are used. Thus, in order to decompose the effects of changes in the composition of the workforce over the cycle and its effects on real wage cyclicality, four different samples of individuals will be analyzed in this study.

The first includes all the individuals that are present in every year of the twelve years surveyed. Since unique identifiers are available for each worker, individuals can be followed over the entire sample period. A separate analysis will also be made for those workers that never changed employer over all that period (job stayers). Even though this method of analyzing the exact same workers from the *QP* files over the time avoids the problem of composition bias, it does not avoid the problem of selectivity bias that may arise when wages of ever employed workers are followed over the cycle. In fact, the population represented by this sample may experience different wage cyclicality than is experienced by other groups in the labor force, namely those with a lower attachment to employment/workforce. In order to surpass these selectivity problems, a second data set that contains the individuals employed for two consecutive years was also constructed.

Finally, and in order to evaluate heterogeneity in wage responses to aggregate unemployment between continuously employed workers and hirings and separations, two additional data sets were constructed. One that includes newly hired workers (accessions) and the other that contains recently separated workers (separations). Next we will describe more accurately each of these four samples.

As mentioned above, the first data set contains all the workers that are present in each and every one of the twelve years surveyed.[10] This sample was restricted to individuals aged between 18 and 52 years old in 1986, excluding agricultural workers.[11] We have also excluded those individuals for whom some explanatory variable is not available for a particular year, namely those with no information on wages. In order to minimize the effects of outliers in wages, for each wage measure used we dropped 0.5% of the observations corresponding to the top and bottom tails of the wage distribution. After these exclusions, a balanced panel of 39,284 men and a balanced panel of 12,926 women was assembled. Hereinafter, we will call this sample 'long-term employee'. The information on the identification number of the firm allows us to obtain from this data set a subsample of job stayers, i. e, workers that stayed with the same employer over the entire period 1986-98 (long-term employee/job stayers). This subsample is comprised of a balanced panel of 23,809 men and 8,623 women.

The second data set contains a sample of individuals that are present in two consecutive years.[12] This sample was also restricted to individuals aged between 18 and 64 years old, excluding agricultural workers. Those individuals for whom some explanatory variable is not available for a particular year, as well as the wages' outliers, were both excluded from the sample. An unbalanced panel of 170,414 observations on men and 101,750 on women was obtained. We will call this data set 'two-year employee'.

The third data set (hereinafter 'accessions') includes a random sample of individuals that in each year are classified in the *QP* data files as a newly hired worker. A worker is classified in each year as newly hired if his tenure in that year is less or equal to one year. We obtained for the 12 pooled cross-sections, 115,009 observations on men and 72,662 on women.[13]

Finally, the fourth data set (hereinafter 'separations') includes a random sample of individuals that in each year are classified as a recently separated worker. A worker is classified in each year as recently separated if he (she) is present in the *QP* registers in year t but is not present in year $t+1$. In order to control for separations we need to exclude the years of 1989 and 1998. Thus, this sample is comprised of 10 pooled cross-sections corresponding to 88,994 observations on men and 56,979 on women.[14]

[10] When a worker is present in the *QP* files for more than one time in a given year, the register in the firm in which he had worked a higher number of hours was selected.

[11] In agriculture a considerable amount of payments are non-pecuniary. We thought it better to exclude these workers from the analysis. In any case, the number of these workers is almost negligible.

[12] The sample was drawn according to a normal random number generator.

[13] The same restrictions applied to the sample of two-year employee hold for this sample.

[14] The same restrictions applied to the sample of two-year employee hold for this sample.

5 Empirical Results

5.1 Empirical Model

The empirical model that will be used to test for real wage cyclicality is a classic human-capital wage equation with a control for business cycle conditions. The static form of the model is:

$$W_{it} = \alpha_i + \gamma_1 t + \gamma_2 t^2 + \gamma_3 U_{t-1} + \gamma_4 Z_i + \gamma_5 X_{it} + \gamma_6 X_{it}^2 + \varepsilon_{it},$$

$$i = 1, ..., N; \qquad t = 1, ..., T \tag{2}$$

where W_{it} is the natural log of the real wage of individual i in time t, U_{t-1} is the aggregate unemployment rate in period $t-1$, t and t^2 are a time trend and its square, X_{it} is a vector of time-varying worker characteristics such as experience and its square (X_{it}^2), Z_i is a vector of time-invariant worker characteristics such as education, α_i is a vector of unobserved individual-specific characteristics that are fixed over time and ε_{it} is a zero-mean random term with constant variance.

If α_i is correlated with the regressors, estimating (2) by ordinary least squares (OLS) would yield biased estimates of the γ's parameters. Whenever possible, a fixed effects estimator (within-group estimator) will be used in order to deal with this potential problem (and, thus, estimate consistently the model parameters). In this case, OLS is applied to the following transformed model of equation (2):

$$\widetilde{w}_{it} = \delta_1 \widetilde{t} + \delta_2 \widetilde{t^2} + \delta_3 \widetilde{U}_{t-1} + \delta_4 \widetilde{X}_{it} + \delta_5 \widetilde{X}_{it}^2 + \widetilde{\varepsilon}_{it} \tag{3}$$

where $\widetilde{w}_{it}, \widetilde{t}, \widetilde{t^2}, \widetilde{U}_{t-1}, \widetilde{X}_{it}, \widetilde{X}_{it}^2$ and $\widetilde{\varepsilon}_{it}$ are the variables listed in their deviations from individual time-series means. The δ coefficients are defined as: $\delta_1 = \gamma_1 + \gamma_{51}$, $\delta_2 = \gamma_2$, $\delta_3 = \gamma_3, \delta_4 = \gamma_{5j}$ $(j = 2, ..., k)$ and $\delta_5 = \gamma_6$. The parameter γ_{51} refers to the coefficient on experience and the parameters γ_{5j} refer to the coefficients on other time-varying worker characteristics. With this transformation the disturbance term, $\widetilde{\varepsilon}_{it}$, is uncorrelated with the regressors. In fact, in the fixed effects model, unlike the random effects model, consistency of the coefficient estimates may be retained even when the individual-specific terms are correlated with the regressors.

The parameter δ_3 (γ_3) measures the percent wage change in response to a one-point increase in the unemployment rate. A negative value of δ_3 (γ_3) implies that wages rise when unemployment diminishes, so that wages are procyclical. If, on the contrary, δ_3 (γ_3) is positive, wages are countercyclical.

Model (2) cannot be applied to the samples of hirings and separations since, by construction, panel data are not available in these two cases. To deal with this problem, equation (2) will be estimated by OLS with no control for individual unobserved heterogeneity. In order to enable the comparison of the results

obtained for continuously employed workers and workers' hirings and separations, the OLS estimates of equation (2) without individual-specific effects will also be reported for the former.

5.2 Results

In this Section the main empirical results obtained from the different regression models are presented. In Section 5.2.1 the OLS and fixed-effects regression results are reported for continuously employed workers. In Section 5.2.2 the OLS regression estimates are shown for workers' hirings and separations. All results are presented separately for men and women.

5.2.1 Continuously Employed Workers

The empirical analysis starts with the study of real wage cyclicality of those individuals that remained employed over the entire period of 1986-98 (long-term employee).

In Table 9 the OLS estimates of equation (2) with no individual specific effects are presented for two different specifications (men and women separately). In both cases the dependent variable is the natural logarithm of the average hourly earnings (AHE) deflated by the CPI (1985 PTE).[15] The AHE is obtained by dividing the total regular payroll in the month by the total number of normal hours worked.[16] Specification (1) includes a constant (CONST), the unemployment rate (U), a trend (T) and its square (TSQ). Since wages are set at least six months to one year in advance, there is a delayed relationship between wages and economic growth. To capture this lagged effect we use the unemployment rate of the previous year. Specification 2 also includes some controls for workers' observed heterogeneity. Education (EDUC) refers to the total number of years of schooling completed.[17] Worker's age is used as a proxy for experience (AGE). Seven dummies that characterize worker's skill are also added.[18] Descriptive statistics (mean, standard deviation, minimum and maximum) of all these variables are provided in Tables A.1 (for men) and A.2 (for women) of Appendix A.

[15] Between 1986-93 the price index is calculated from March of year $t-1$ to March of year t, whereas in the 1994-98 period the price index is calculated from October of year $t-1$ to October of year t. Between 1993 and 1994 there is an adjustment of a year and a half because in 1993 wages refer to March and in 1994 wages refer to October.

[16] Total regular payroll includes base wages, seniority payments and regular benefits.

[17] It should be noted that some workers obtained a higher educational level while employed.

[18] See Table A.1 in Appendix A for a definition of the qualification levels.

Table 9: OLS Results
Long-term Employee
(Dependent variable: log Average Hourly Earnings)

	Men		Women	
Independent Variables	(1)	(2)	(1)	(2)
U	-0.98	-1.00	-0.69	-0.75
	(-12.6)	(-15.9)	(-4.3)	(-7.1)
T	0.0328	0.0077	0.0309	0.0006*
	(31.2)	(9.0)	(14.1)	(0.4)
TSQ	0.0005	0.0012	0.0001*	0.0008
	(5.5)	(17.2)	(0.7)	(6.5)
AGE		0.0613		0.0519
		(121.7)		(63.9)
AGESQ		-0.0006		-0.0004
		(-102.2)		(-45.0)
EDUC		0.0594		0.0921
		(288.8)		(283.2)
Qualification Level				
Q1		0.4788		0.3701
		(69.3)		(32.4)
Q2		0.4922		0.4834
		(78.9)		(50.6)
Q3		0.2483		0.2454
		(43.6)		(28.4)
Q4		0.2736		0.2928
		(47.1)		(34.8)
Q5		0.1071		0.0763
		(19.5)		(9.7)
Q6		0.0705		-0.0418
		(12.7)		(-5.3)
Q7		-0.0523		0.0453
		(-8.9)		(5.5)
CONST	5.501	3.685	5.275	3.473
	(847.6)	(299.1)	(389.6)	(183.6)
$\overline{R}^2$	0.12	0.42	0.06	0.61
Sum of squared residuals	77782.7	51144.0	36647.7	15338.1
Number of Observations	471408		155112	

Notes: (i) t-statistics are in parentheses;
(ii) all estimates are significant at 1%, except those with an *.

The OLS estimates show evidence of a moderate procyclical behavior of real wages for both men and women. According to specification 2 of Table 9, a 1-percentage point decrease in the national unemployment rate raises average hourly earnings by 1.0 percent for men and by 0.75 percent for women. Controlling for worker observed heterogeneity gives more precise estimates of the unemployment rate coefficient. The less procyclical behavior of women's real wages compared to men's real wages is in accordance with previous findings shown by Tremblay (1990) and Solon *et al.* (1994).

Table 10 shows the estimates of the unemployment rate coefficient for specification 2 using three other wage measures. In column 2 the hourly earnings including overtime pay (AHEIOT)[19] measure is used and in columns 3 and 4 the hourly base wage (AHBW)[20] and the monthly base wage (AMBW) are adopted, respectively. For comparison reasons the unemployment coefficient estimates for AHE are reported in column 1.

The inclusion of overtime pay does not change the hourly wage cyclicality of either men or women. Hourly earnings (AHEIOT) decrease by 1.04 percent and 0.70 percent in response to a one percentage point increase in the unemployment rate, for men and women, respectively. This result is not surprising since in the Portuguese labor market overtime hours represent a non-significant percentage of total hours worked. In fact, for the period 1986-98, overtime work for firms employing paid labor corresponds, on average, to 0.9% of the total number of hours worked.

Comparing the figures obtained for the estimates of the unemployment coefficient using an hourly measure (AHBW) or instead, a monthly measure (AMBW), leads us to conclude that hourly wages are more procyclical than monthly wages. According to Table 10, a one percentage point decrease in the unemployment rate raises average hourly base wages of male (female) workers by 1.10% (1.08%) and average monthly base wages by only 0.74% (0.28%). This result appears to suggest that, if anything, normal hours worked tend to behave in a slightly countercyclical fashion.[21]

[19] The AHEIOT is defined as the ratio between total regular payroll including overtime pay and the sum of normal and extra hours of work.

[20] The AHBW is defined as the ratio between the monthly base wage and the total number of normal hours worked in the month.

[21] This somewhat unexpected behavior in usual hours of work may be justified by the fact that the period under analysis (mainly an expansionary period) is characterized by a gradual reduction in the average duration of work that reached its peaks in 1991 and 1997 (see *INE - Employment Survey*). In fact, in 1991 a reduction in the normal period of work from 48 to 44 hours per week was legally imposed and in 1996 a further reduction from 44 to 40 hours per week was implemented. This may justify why hourly wages over that period display a more procyclical behavior than wages per employee.

Table 10: OLS Results (specification 2)
Long-term Employee
Alternative Wage Measures

	Wage Measure			
	AHE	AHEIOT	AHBW	AMBW
Men				
Cycle Regressor (U)	-1.00	-1.04	-1.10	-0.74
	(-15.9)	(-16.3)	(-21.0)	(-15.2)
Women				
Cycle Regressor (U)	-0.75	-0.70	-1.08	-0.28
	(-7.1)	(-6.6)	(-11.9)	(-3.4)

Notes: (i) t-statistics are in parentheses;
(ii) all estimates are significant at 1%.

In Tables 11 and 12 the same regression results are presented for the subsample of job stayers.[22] The results reported for male and female job stayers exhibit a slightly more procyclical behavior of wages in contrast with previous empirical findings of a higher procyclicality of real wages for job changers [see, for example, Bils (1985) and Shin (1994)]. Once again, the results reveal that monthly wages are less procyclical than hourly wages (see Table 12).

[22] Tables A.3 (for men) and A.4 (for women) in Appendix A contain the descriptive statistics for these samples of workers.

Table 11: OLS Results
Long-term Employee/Job Stayers
(Dependent variable: log Average Hourly Earnings)

	Men		Women	
Independent Variables	(1)	(2)	(1)	(2)
U	-1.11	-1.20	-0.79	-0.85
	(-11.5)	(-15.8)	(-4.0)	(-6.7)
T	0.0272	0.0033	0.0280	-0.00008*
	(20.8)	(3.2)	(10.4)	(-0.0)
TSQ	0.0009	0.0016	0.0003*	0.0009
	(8.5)	(18.5)	(1.5)	(6.5)
AGE		0.0549		0.0485
		(91.0)		(50.1)
AGESQ		-0.0005		-0.0004
		(-74.4)		(-35.4)
EDUC		0.0634		0.0933
		(246.9)		(231.4)
Qualification Level				
Q1		0.4859		0.3413
		(53.3)		(23.5)
Q2		0.5253		0.4639
		(66.6)		(39.6)
Q3		0.2643		0.2153
		(36.2)		(19.8)
Q4		0.2782		0.2723
		(37.3)		(25.8)
Q5		0.1125		0.0458
		(15.9)		(4.7)
Q6		0.0117*		-0.0860
		(1.6)		(-8.7)
Q7		-0.0325		0.0228
		(-4.3)		(2.2)
CONST	5.482	3.771	5.280	3.583
	(678.8)	(250.2)	(318.4)	(155.2)
$\overline{R}^2$	0.12	0.46	0.06	0.62
Sum of squared residuals	44246.4	27260.9	24459.4	9991.6
Number of Observations	285708		103476	

Notes: (i) t-statistics are in parentheses;
(ii) all estimates are significant at 1%, except those with an *.

Table 12: OLS Results (specification 2)
Long-term Employee/Job Stayers
Alternative Wage Measures

	Wage Measure			
	AHE	AHEIOT	AHBW	AMBW
Men				
Cycle Regressor (U)	-1.20	-1.23	-1.23	-0.83
	(-15.8)	(-16.0)	(-19.2)	(-13.5)
Women				
Cycle Regressor (U)	-0.85	-0.82	-1.16	-0.39
	(-6.7)	(-6.4)	(-10.4)	(-3.8)

Notes: (i) t-statistics are in parentheses;
(ii) all estimates are significant at 1%.

The results obtained from the sample of long-term employee should be interpreted with caution, due to the potential problem of selection bias. In fact, a sample selection bias may arise when only employed workers are followed over the cycle. The bias may arise if those workers who move in and out of the workforce over the cycle have (un)observed characteristics systematically different from those who stay in. Beyond that, the population represented by this sample may experience different wage cyclicality than what is experienced by other groups in the labor force, namely those with more unstable labor market attachments.

In order to avoid these problems, an identical empirical analysis will be made for the sample of workers employed for two consecutive years (two-year employee).[23] Tables 13 and 14 present the OLS results for both men and women. For male workers, an unemployment coefficient estimate of -1.16 was obtained for specification 2 (see column 2 of Table 13), indicating a more procyclical behavior of men's real wages when compared to the unemployment rate estimate obtained for the sample of long-term employee (-1.00). For women, the results for the sample of two-year employee reveal a less procyclical behavior of real wages. An unemployment coefficient estimate of -0.45 (see column 4 of Table 13) was obtained against a value of -0.75 for long-term employees. When alternative wage measures are used this same pattern of results holds for both men and women (see Table 14).

Concerning the estimates obtained for the regression coefficients of the other explanatory variables, the estimation results reveal that, in general, qualification levels affect wages more significantly for the sample of two-year employee than for the sample of long-term employee. For men, the effect of age is higher for the sample of long-term employee whereas for education the effect is more pronounced for the sample of two-year employee. For women the effect of age and education on wage determination is more pronounced for the sample of long-term employee than for the sample of two-year employee.

[23] Tables A.5 (for men) and A.6 (for women) in Appendix A provide the descriptive statistics for these samples of workers.

Table 13: OLS Results
Two-year Employee
(Dependent variable: log Average Hourly Earnings)

	Men		Women	
Independent Variables	(1)	(2)	(1)	(2)
U	-1.38	-1.16	-0.13*	-0.45
	(-8.3)	(-9.7)	(-0.7)	(-3.3)
T	0.0322	0.0234	0.0294	0.0152
	(12.7)	(12.7)	(10.2)	(7.4)
TSQ	-0.0002*	-0.0004	0.00005*	-0.0001*
	(-0.8)	(-2.9)	(0.2)	(-0.7)
AGE		0.0539		0.0345
		(90.8)		(49.3)
AGESQ		-0.0005		-0.0003
		(-70.8)		(-31.5)
EDUC		0.0639		0.0683
		(177.7)		(163.1)
Qualification Level				
Q1		0.6925		0.7333
		(92.0)		(71.4)
Q2		0.6903		0.6698
		(94.9)		(70.9)
Q3		0.4423		0.4576
		(74.4)		(56.3)
Q4		0.4518		0.5054
		(74.8)		(76.9)
Q5		0.2043		0.1854
		(42.8)		(41.3)
Q6		0.1513		0.1052
		(29.7)		(22.7)
Q7		0.0308		0.0927
		(5.7)		(17.6)
CONST	5.374	3.581	5.024	3.728
	(349.9)	(229.9)	(285.6)	(212.7)
$\overline{R}^2$	0.05	0.50	0.06	0.51
Sum of squared residuals	43732.6	23026.2	21699.1	11082.9
Number of Observations	170414		101750	

Notes: (i) t-statistics are in parentheses;
(ii) all estimates are significant at 1%, except those with an *.

Table 14: OLS Results (specification 2)
Two-year Employee
Alternative Wage Measures

	Wage Measure			
	AHE	AHEIOT	AHBW	AMBW
Men				
Cycle Regressor (U)	-1.16	-1.18	-1.03	-0.58
	(-9.7)	(-9.7)	(-10.0)	(-5.2)
Women				
Cycle Regressor (U)	-0.45	-0.41	-0.67	-0.32*
	(-3.3)	(-3.0)	(-5.5)	(-2.2)

Notes: (i) t-statistics are in parentheses;
(ii) all estimates are significant at 1%, except those with an *.

Finally, in order to account for unobserved individual heterogeneity, equation (2) was re-estimated using a fixed effects regression model. The results for both data sets and for specification 2 are reported in Table 15. The fixed effects estimates of the unemployment rate coefficient obtained for the sample of long-term employee are identical to those obtained for this sample of workers using OLS. The main difference is the precision of the regression coefficients as indicated by the t-statistics, which is visibly higher for the estimation with individual fixed effects.[24] As would be expected, the effects on wages of those variables that account for observed worker heterogeneity are estimated with some trepidation when the fixed effects estimator is used. In fact, in the presence of a fixed effects model, those variables that control for worker heterogeneity are only taken into account whenever a within-individual change occurs, which may magnify the bias induced by measurement error in such variables.

Regarding the sample of two-year employee the OLS and fixed effects estimates diverge considerably in magnitude and precision. For men, the unemployment rate estimate is -0.45, whereas for women this same coefficient is not statistically significantly different from zero (see columns 2 and 4 of Table 15).

In a nutshell, the fixed effects results showed a procyclical behavior of real hourly wages for men, whereas for women the results are not conclusive. The OLS results exhibited a strongly procyclical behavior of men's real hourly wages (including job stayers) and a moderate procyclical behavior of women's real hourly wages.

The comparison of the OLS with the fixed effects regression results for these two samples seems to suggest that unobserved heterogeneity plays a non-trivial role in the cyclicality of wages. Leaving aside cross-sectional heterogeneity is relevant for the sample of two-year employee, but not in the case of the long-term employee. We tentatively speculate that unobserved heterogeneity tends to affect the composition of the workforce in a way that magnifies the cyclicality of real wages.

[24] The same is true for the sub-sample of job stayers. Results available upon request.

Table 15: Fixed Effects Results
(Dependent variable: log Average Hourly Earnings)

	Men		Women	
Independent Variables	Long-term Employee	Two-year Employee	Long-term Employee	Two-year Employee
U	-0.98	-0.45	-0.71	-0.04*
	(-34.5)	(-4.6)	(-15.5)	(-0.3)
T	0.0510	0.0340	0.0394	0.0210
	(105.1)	(21.8)	(51.5)	(10.8)
TSQ	0.0008	-0.0001*	0.0004	0.0004
	(24.6)	(-0.5)	(7.4)	(2.6)
AGESQ	-0.0003	0.00005	-0.0002	0.00007
	(-69.8)	(11.2)	(-25.5)	(11.3)
EDUC	0.0076	0.0462	0.0130	0.0370
	(18.7)	(67.0)	(19.8)	(42.1)
Qualification Level				
Q1	0.2546	0.3824	0.3363	0.3317
	(55.0)	(41.3)	(44.9)	(24.6)
Q2	0.1665	0.3397	0.1880	0.2540
	(45.4)	(40.9)	(31.9)	(22.7)
Q3	0.1230	0.2606	0.1808	0.2328
	(39.1)	(37.5)	(34.9)	(21.4)
Q4	0.0992	0.2352	0.1149	0.2413
	(31.4)	(35.2)	(24.0)	(29.3)
Q5	0.0490	0.1286	0.0450	0.1122
	(17.3)	(26.7)	(11.0)	(23.1)
Q6	0.0416	0.0902	0.0246	0.0702
	(14.0)	(16.9)	(5.8)	(13.6)
Q7	0.0308	0.0366	-0.0009*	0.0547
	(9.3)	(6.3)	(-0.2)	(8.2)
$\overline{R}^2$	0.88	0.88	0.93	0.88
Sum of squared residuals	9601.5	2939.4	2677.2	1511.7
Number of Observations	471408	170414	155112	101750

Notes: (i) t-statistics are in parentheses;
(ii) all estimates are significant at 1%, except those with an *.

5.2.2 Workers' Accessions and Separations

In this Section we examine real wage cyclicality for workers' hiring and separations. Previous research on real wage cyclicality has been investigating the heterogeneity in real wage behavior for workers with a different mobility status, namely job changers and job stayers. However, the issue of heterogeneity for workers' accessions and separations has not yet been explored in the literature. One of the purposes of this study is to investigate how external labor market conditions affect a worker's wage at the moment of hiring and separation. This analysis will enable us to identify the cycle consequences (in terms of wages) for those workes who search for a new job (wage offers) and for those workers who left (voluntary or involuntarily) a job (wage losses). Are real wages sensitive to the conditions prevailing in the labor market when a hiring or separation occurs?

In Tables 16 and 17 the OLS estimates for newly hired workers are presented separately for both men and women.[25] As mentioned in Section 4.2, the design of the sample is cross-sectional, making the use of panel data estimators unfeasible.

The overall results indicate a strongly procyclical behavior of real wages of newly hired workers, regardless of considering the sample of men or women or the wage measure being used. According to specification 2 of Table 16, an unemployment rate coefficient of -2.08 was obtained for men and a slightly less procyclical one of -1.78 for women. These values are considerably higher than those obtained for continuously employed workers, in particular, for job stayers.

The estimates of Table 16 also show the importance of qualifications in wage determination for this sample of workers when compared to continuously employed workers. The effects of education and age on wages are not as strong as for continuously employed workers.

These results suggest that in booms newly hired workers gain access to jobs that pay higher wages. Some alternative explanations have been advanced in order to explain why new hires have more procyclical wages. The more frequent relies on the existence of interindustry wage differentials. This interpretation was first advanced by Okun (1973), who argued that certain jobs offer rents to workers. If these sectors are also more cyclically sensitive, workers can switch into high-paying jobs during booms because such jobs are less tightly rationed during these times. The problem with this explanation is that many of the workers who change jobs in booms leave these jobs in subsequent recessions. Moreover, Okun did not explain what the sources of interindustry wage differentials are.

Recently, Barlevy (2001) offered a new explanation for the existence of more procyclical wages of job changers: compensating differentials. In order to show that compensating differentials instead of interindustry wage differentials generate a more procyclical behavior of wages of changers, Barlevy developed a model that relates unemployment insurance and wage cyclicality. His empirical finding of a negative relationship between wage cyclicality among job changers

[25] In Tables A.7 (for men) and A.8 (for women) of Appendix A the descriptive statistics of all variables are provided for this dataset.

and the level of unemployment insurance benefits, supports the view that job changers' wages are more procyclical because in booms they obtained jobs that pay a compensating differential for the risk of layoff. In this case, workers who change jobs during booms may not realize true gains from the higher wages they receive, since these gains are typically offset during recessions.

Beaudry and DiNardo (1991) advanced a more convincing explanation for the differences in wage cyclicality between job stayers and job changers, even though their explanation abstracts from heterogeneity across jobs. According to their findings, current unemployment rate does not affect wages after controlling for the best labor market conditions, since a worker was hired at his/her current job. Indeed, when workers are not mobile between employers, current labor market conditions do not affect current wages. In this case, current wages are negatively correlated with the unemployment rate at the time each worker was hired. However, if workers are very mobile, wages are correlated with the best labor market conditions observed since the worker was hired.

Arozamena and Centeno (2001) present a model that combines job matching and business cycle effects and argue that as the employment relationship progresses and specific human capital is accumulated, the worker, by receiving a fraction of the return to that human capital, is gradually insulated from cyclical variations in the external labor market. They found robust empirical evidence supporting this prediction: the elasticity of wages to the unemployment rate decreases with tenure.

The results obtained for the sample of newly hired workers (accessions) seem to be more consistent with these last two explanations. Newly hired workers have more procyclical wages because they hold more unstable job matches with no access to insurance, being subject to the aggregate conditions that prevail in the labor market at the time they start a new job. It is noteworthy that in Portugal, as shown by Varejão and Portugal (2001), accessions and separations occur predominantly in the group of workers with temporary contracts. According to their findings, between 1991 and 1998, fixed-term contracts account for 62% of all accessions and 43% of all separations.

Table 16: OLS Results
Accessions
(Dependent variable: log Average Hourly Earnings)

	Men		Women	
Independent Variables	(1)	(2)	(1)	(2)
U	-2.15	-2.08	-1.72	-1.78
	(-13.3)	(-16.1)	(-9.6)	(-12.6)
T	0.0220	0.0171	0.0186	0.0133
	(10.2)	(9.9)	(7.8)	(7.1)
TSQ	0.0010	0.0005	0.0012	0.0006
	(5.9)	(3.5)	(6.4)	(4.2)
AGE		0.0293		0.0217
		(45.8)		(28.3)
AGESQ		-0.0003		-0.0002
		(-36.9)		(-21.7)
EDUC		0.0385		0.0431
		(98.8)		(102.5)
Qualification Level				
Q1		0.8542		0.7876
		(104.1)		(70.9)
Q2		0.7206		0.7184
		(85.8)		(69.9)
Q3		0.5511		0.4752
		(78.2)		(40.8)
Q4		0.5222		0.5577
		(75.9)		(79.9)
Q5		0.2527		0.1731
		(74.0)		(53.4)
Q6		0.1792		0.1277
		(44.5)		(36.3)
Q7		0.1238		0.1372
		(33.7)		(36.7)
CONST	5.130	4.160	4.942	4.122
	(381.9)	(274.6)	(331.5)	(305.0)
$\overline{R}^2$	0.10	0.42	0.10	0.44
Sum of squared residuals	19897.7	12790.7	10529.1	6536.3
Number of Observations	115009		72662	

Notes: (i) t-statistics are in parentheses;
(ii) all estimates are significant at 1%.

Table 17: OLS Results (specification 2)
Accessions
Alternative Wage Measures

	Wage Measure			
	AHE	AHEIOT	AHBW	AMBW
Men				
Cycle Regressor (U)	-2.08	-2.08	-2.11	-2.14
	(-16.1)	(-16.1)	(-19.2)	(-15.6)
Women				
Cycle Regressor (U)	-1.78	-1.78	-1.79	-1.46
	(-12.6)	(-12.6)	(-14.1)	(-9.0)

Notes: (i) t-statistics are in parentheses;
(ii) all estimates are significant at 1%.

Tables 18 and 19 report the same regression results for the sample of recently separated workers (men and women).[26] Once again, the estimates of the unemployment rate coefficient exhibit a procyclical behavior of average hourly earnings. A 1-percentage point increase in the unemployment rate decreases average hourly earnings by 0.6% for men and by about 1.0% for women. Two facts emerge from these results. The first is the existence of a more pronounced cyclical behavior of wages for female separations than for continuously employed females. This figure of 1.0% can be compared to that of 0.45% for women employed for two consecutive years. The second is, in contrast with previous results, the existence of a greater cyclical wage sensitivity for female separations than for male separations.

Both pieces of evidence are likely to be produced by the heterogeneity in the composition of the pool of separations of men and women. The pool of separations may include workers with a low tenure as, for example, those with a fixed-term contract, and may include workers with a higher tenure as, for instance, workers close to retirement. In other situations, separations may be produced by the displacement of workers due to collective dismissals or the shutdown of the plant. In such cases, wage concession mechanisms may be at work.

Low-tenure workers, mostly women, account for a disproportionate share of worker turnover. In fact, in the sample a half of the total separations is produced by workers with three or fewer years of tenure. If we exclude from the separation sample those workers with more than three years of tenure we obtain a higher unemployment regression coefficient (-1.2% for both men and women). Or in another way, 33 percent of the separations are also classified as accessions over the one year interval. If we excise these workers from the sample we would obtain much lower unemployment regression coefficients (0.42% for men and 0.69% for women).

[26] In Tables A.9 (for men) and A.10 (for women) of Appendix A the descriptive statistics of all variables are provided for this data set.

Table 18: OLS Results
Separations
(Dependent variable: log Average Hourly Earnings)

	Men		Women	
Independent Variables	(1)	(2)	(1)	(2)
U	-0.37*	-0.60	-0.72*	-1.02
	(-1.4)	(-2.8)	(-2.5)	(-4.4)
T	0.0517	0.0409	0.0259	0.0205
	(12.5)	(12.8)	(5.8)	(5.8)
TSQ	-0.0018	-0.0018	0.0002*	-0.0003*
	(-4.9)	(-6.4)	(0.4)	(-1.0)
AGE		0.0316		0.0228
		(42.6)		(26.4)
AGESQ		-0.0003		-0.0002
		(-29.3)		(-16.4)
EDUC		0.0471		0.0493
		(91.2)		(89.0)
Qualification Level				
Q1		0.8334		0.7763
		(80.5)		(53.1)
Q2		0.7800		0.7625
		(76.2)		(60.0)
Q3		0.5335		0.5044
		(69.0)		(43.7)
Q4		0.5193		0.5866
		(63.2)		(67.8)
Q5		0.2443		0.1855
		(47.7)		(38.3)
Q6		0.1858		0.1392
		(32.4)		(27.4)
Q7		0.0979		0.1141
		(17.3)		(20.0)
CONST	5.093	3.919	4.969	4.036
	(218.7)	(176.6)	(196.2)	(162.6)
$\overline{R}^2$	0.06	0.44	0.05	0.42
Sum of squared residuals	20952.5	12574.8	10469.5	6388.9
Number of Observations	88894		56979	

Notes: (i) t-statistics are in parentheses;
(ii) all estimates are significant at 1%, except those with an *.

Table 19: OLS Results (specification 2)
Separations
Alternative Wage Measures

	Wage Measure			
	AHE	AHEIOT	AHBW	AMBW
Men				
Cycle Regressor (U)	-0.60	-0.58	-0.53	-0.38*
	(-2.8)	(-2.7)	(-2.9)	(-1.8)
Women				
Cycle Regressor (U)	-1.02	-0.96	-0.98	-0.81
	(-4.4)	(-4.1)	(-4.7)	(-3.1)

Notes: (i) t-statistics are in parentheses;
(ii) all estimates are significant at 1%, except those with an *.

6 Conclusion

The aim of this study is to provide further evidence on real wage cyclicality using Portuguese data for the period 1986-98, addressing the issue of heterogeneity in wages responses to aggregate labor market conditions for workers' hirings and separations.

The empirical evidence gathered in this exercise is fourfold. First, there is an indication of a moderate procyclical behavior of real wages for continuously employed workers, in particular, for job stayers. This pattern holds for different measures of wages used and specifications. Second, the comparison of the OLS with the fixed-effects regression results suggests that unobserved heterogeneity plays a non-trivial role in the cyclicality of wages in a way that magnifies the cyclicality of real wages.

Third, the examination of real wage cyclicality of workers' accessions revealed a strong procyclical behavior of wages for this type of worker. This empirical evidence is in accordance with the idea that entry wages are much more procyclical than current wages, which confirms previous empirical research consistent with the hypothesis of implicit shielding agreements between employers and workers in wage determination [Beaudry and DiNardo (1991) and Arozamena and Centeno (2001)]. Four, whereas in the case of accessions the evidence of cyclicality is very strong, for the case of separations a number of conflicting forces seem to be at work. Here it is worth emphasizing that a non-trivial portion of separations are made-up of recent hirings. This particular composition of the separation pool tends to amplify the cyclicality of the wages of separated workers.

In sum, the empirical evidence suggests that even micro-data estimates of real wage cyclicality may conceal a strong procyclical wage behavior, when heterogeneity on wages responses to aggregate conditions between employed workers and hirings and separations is not taken into account.

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APPENDIX A - Descriptive Statistics

Table A.1: Descriptive Statistics (1986-98)
Long-term Employee/Men

	MEAN	STDV	MIN	MAX
Variables				
Unemployment Rate (U)	6.34	1.45	4.1	8.5
Trend (T)	6.17	3.85	0.0	12.0
Age (AGE)	42.00	8.08	18.0	64.0
Education (EDUC)	5.59	2.73	0.0	16.0
Qualification Level				
Manager and Highly Professional (Q1)	0.015		0.0	1.0
Professional (Q2)	0.028		0.0	1.0
Supervisors (Q3)	0.097		0.0	1.0
Highly Skilled (Q4)	0.066		0.0	1.0
Skilled (Q5)	0.572		0.0	1.0
Semi-skilled (Q6)	0.171		0.0	1.0
Unskilled (Q7)	0.042		0.0	1.0
Apprentices (Q8)	0.008		0.0	1.0
Average Hourly Earnings (AHE)	5.669	0.43	4.35	7.18
Number of Observations	471408			
Average Hourly Earnings inc OT (AHEIOT)	5.681	0.44	4.35	7.18
Avearge Hourly Base Wages (AHBW)	5.454	0.37	4.32	6.84
Average Monthly Base Wages (AMBW)	10.606	0.33	8.99	11.74

Table A.2: Descriptive Statistics (1986-98)
Long-term Employee/Women

	MEAN	STDV	MIN	MAX
Variables				
Unemployment Rate (U)	6.34	1.45	4.1	8.5
Trend (T)	6.17	3.85	0.0	12.0
Age (AGE)	39.34	7.86	18.0	64.0
Education (EDUC)	6.20	3.04	0.0	16.0
Qualification Level				
Manager and Highly Professional (Q1)	0.010		0.0	1.0
Professional (Q2)	0.022		0.0	1.0
Supervisors (Q3)	0.045		0.0	1.0
Highly Skilled (Q4)	0.073		0.0	1.0
Skilled (Q5)	0.438		0.0	1.0
Semi-skilled (Q6)	0.321		0.0	1.0
Unskilled (Q7)	0.081		0.0	1.0
Apprentices (Q8)	0.011		0.0	1.0
Average Hourly Earnings (AHE)	5.431	0.50	4.35	7.17
Number of Observations	155112			
Average Hourly Earnings inc OT (AHEIOT)	5.434	0.50	4.35	7.18
Average Hourly Base Wages (AHBW)	5.282	0.45	4.34	6.82
Averahe Monthly Base Wages (AMBW)	10.404	0.40	8.99	11.71

Table A.3: Descriptive Statistics (1986-98)
Long-term Employee/Men Job Stayers

	MEAN	STDV	MIN	MAX
Variables				
Unemployment Rate (U)	6.34	1.45	4.1	8.5
Trend (T)	6.17	3.85	0.0	12.0
Age (AGE)	42.59	8.15	18.0	64.0
Education (EDUC)	5.41	2.57	0.0	16.0
Qualification Level				
Manager and Highly Professional (Q1)	0.011		0.0	1.0
Professional (Q2)	0.030		0.0	1.0
Supervisors (Q3)	0.106		0.0	1.0
Highly Skilled (Q4)	0.065		0.0	1.0
Skilled (Q5)	0.573		0.0	1.0
Semi-skilled (Q6)	0.162		0.0	1.0
Unskilled (Q7)	0.046		0.0	1.0
Apprentices (Q8)	0.007		0.0	1.0
Average Hourly Earnings (AHE)	5.630	0.42	4.35	7.18
Number of Observations	285708			
Average Hourly Earnings inc OT (AHEIOT)	5.643	0.43	4.35	7.18
Average Hourly Base Wages (AHBW)	5.423	0.37	4.32	6.84
Average Monthly Base Wages (AMBW)	10.587	0.33	8.99	11.74

Table A.4: Descriptive Statistics (1986-98)
Long-term Employee/Women Job Stayers

	MEAN	STDV	MIN	MAX
Variables				
Unemployment Rate (U)	6.34	1.45	4.1	8.5
Trend (T)	6.17	3.85	0.0	12.0
Age (AGE)	39.68	7.96	18.0	64.0
Education (EDUC)	6.11	3.01	0.0	16.0
Qualification Level				
Manager and Highly Professional (Q1)	0.009		0.0	1.0
Professional (Q2)	0.024		0.0	1.0
Supervisors (Q3)	0.042		0.0	1.0
Highly Skilled (Q4)	0.068		0.0	1.0
Skilled (Q5)	0.415		0.0	1.0
Semi-skilled (Q6)	0.341		0.0	1.0
Unskilled (Q7)	0.091		0.0	1.0
Apprentices (Q8)	0.010		0.0	1.0
Average Hourly Base Earnings (AHE)	5.421	0.50	4.36	7.16
Number of Observations	103476			
Average Hourly Earnings inc OT (AHEIOT)	5.424	0.50	4.36	7.18
Average Hourly Base Wages (AHBW)	5.273	0.45	4.35	6.82
Average Monthly Base Wages (AMBW)	10.400	0.40	8.99	11.71

Table A.5: Descriptive Statistics (1986-98)
Two-year Employee/Men

	MEAN	STDV	MIN	MAX
Variables				
Unemployment Rate (U)	6.39	1.45	4.1	8.5
Trend (T)	6.39	3.75	0.0	12.0
Age (AGE)	38.0	11.14	18.0	64.0
Education (EDUC)	5.99	3.06	0.0	16.0
Qualification Level				
Manager and Highly Professional (Q1)	0.030		0.0	1.0
Professional (Q2)	0.029		0.0	1.0
Supervisors (Q3)	0.066		0.0	1.0
Highly Skilled (Q4)	0.061		0.0	1.0
Skilled (Q5)	0.529		0.0	1.0
Semi-skilled (Q6)	0.151		0.0	1.0
Unskilled (Q7)	0.089		0.0	1.0
Apprentices (Q8)	0.045		0.0	1.0
Average Hourly Earnings (AHE)	5.483	0.52	4.10	7.46
Number of Observations	170414			
Average Hourly Earnings inc OT (AHEIOT)	5.490	0.53	4.10	7.94
Avearge Hourly Base Wages (AHBW)	5.345	0.46	2.60	7.45
Average Monthly Base Wages (AMBW)	10.489	0.47	6.11	12.65

Table A.6: Descriptive Statistics (1986-98)
Two-year Employee/Women

	MEAN	STDV	MIN	MAX
Variables				
Unemployment Rate (U)	6.39	1.41	4.1	8.5
Trend (T)	6.81	3.69	0.0	12.0
Age (AGE)	34.45	10.10	18.0	64.0
Education (EDUC)	6.33	3.11	0.0	16.0
Qualification Level				
Manager and Highly Professional (Q1)	0.014		0.0	1.0
Professional (Q2)	0.017		0.0	1.0
Supervisors (Q3)	0.023		0.0	1.0
Highly Skilled (Q4)	0.050		0.0	1.0
Skilled (Q5)	0.415		0.0	1.0
Semi-skilled (Q6)	0.296		0.0	1.0
Unskilled (Q7)	0.116		0.0	1.0
Apprentices (Q8)	0.070		0.0	1.0
Average Hourly Earnings (AHE)	5.220	0.48	4.12	7.44
Number of Observations	101750			
Average Hourly Earnings inc OT (AHEIOT)	5.222	0.48	4.12	7.48
Avearge Hourly Base Wages (AHBW)	5.128	0.44	3.09	7.42
Average Monthly Base Wages (AMBW)	10.235	0.47	6.01	12.64

Table A.7: Descriptive Statistics (1986-98)
Accessions/Men

	MEAN	STDV	MIN	MAX
Variables				
Unemployment Rate (U)	6.40	1.44	4.1	8.5
Trend (T)	6.13	3.91	0.0	12.0
Age (AGE)	30.91	10.08	18.0	64.0
Education (EDUC)	6.11	3.00	0.0	16.0
Qualification Level				
Manager and Highly Professional (Q1)	0.020		0.0	1.0
Professional (Q2)	0.017		0.0	1.0
Supervisors (Q3)	0.025		0.0	1.0
Highly Skilled (Q4)	0.027		0.0	1.0
Skilled (Q5)	0.460		0.0	1.0
Semi-skilled (Q6)	0.128		0.0	1.0
Unskilled (Q7)	0.195		0.0	1.0
Apprentices (Q8)	0.128		0.0	1.0
Average Hourly Earnings (AHE)	5.188	0.44	3.90	7.36
Number of Observations	115009			
Average Hourly Earnings inc OT (AHEIOT)	5.192	0.44	3.90	7.37
Avearge Hourly Base Wages (AHBW)	5.092	0.39	3.87	7.23
Average Monthly Base Wages (AMBW)	10.205	0.44	7.95	12.29

Table A.8: Descriptive Statistics (1986-98)
Accessions/Women

	MEAN	STDV	MIN	MAX
Variables				
Unemployment Rate (U)	6.35	1.39	4.1	8.5
Trend (T)	6.72	3.84	0.0	12.0
Age (AGE)	29.34	9.11	18.0	64.0
Education (EDUC)	6.71	3.17	0.0	16.0
Qualification Level				
Manager and Highly Professional (Q1)	0.012		0.0	1.0
Professional (Q2)	0.014		0.0	1.0
Supervisors (Q3)	0.010		0.0	1.0
Highly Skilled (Q4)	0.032		0.0	1.0
Skilled (Q5)	0.309		0.0	1.0
Semi-skilled (Q6)	0.212		0.0	1.0
Unskilled (Q7)	0.188		0.0	1.0
Apprentices (Q8)	0.224		0.0	1.0
Average Hourly Earnings (AHE)	5.036	0.40	3.88	7.37
Number of Observations	72662			
Average Hourly Earnings inc OT (AHEIOT)	5.038	0.40	3.88	7.37
Average Hourly Base Wages (AHBW)	4.970	0.37	3.88	7.22
Average Monthly Base Wages (AMBW)	10.037	0.42	7.92	12.30

Table A.9: Descriptive Statistics (1986-97)
Separations/Men

	MEAN	STDV	MIN	MAX
Variables				
Unemployment Rate (U)	6.45	1.56	4.1	8.5
Trend (T)	5.88	3.72	0.0	11.0
Age (AGE)	35.38	12.14	18.0	64.0
Education (EDUC)	5.73	2.88	0.0	16.0
Qualification Level				
Manager and Highly Professional (Q1)	0.024		0.0	1.0
Professional (Q2)	0.022		0.0	1.0
Supervisors (Q3)	0.049		0.0	1.0
Highly Skilled (Q4)	0.039		0.0	1.0
Skilled (Q5)	0.497		0.0	1.0
Semi-skilled (Q6)	0.141		0.0	1.0
Unskilled (Q7)	0.138		0.0	1.0
Apprentices (Q8)	0.090		0.0	1.0
Average Hourly Earnings (AHE)	5.287	0.50	3.88	7.52
Number of Observations	88894			
Average Hourly Earnings inc OT (AHEIOT)	5.290	0.50	3.88	7.52
Average Hourly Base Wages (AHBW)	5.183	0.45	3.87	7.41
Average Monthly Base Wages (AMBW)	10.299	0.48	7.93	12.43

Table A.10: Descriptive Statistics (1986-97)
Separations/Women

	MEAN	STDV	MIN	MAX
Variables				
Unemployment Rate (U)	6.37	1.52	4.1	8.5
Trend (T)	6.32	3.62	0.0	11.0
Age (AGE)	33.09	10.65	18.0	64.0
Education (EDUC)	6.17	3.05	0.0	16.0
Qualification Level				
Manager and Highly Professional (Q1)	0.011		0.0	1.0
Professional (Q2)	0.015		0.0	1.0
Supervisors (Q3)	0.018		0.0	1.0
Highly Skilled (Q4)	0.040		0.0	1.0
Skilled (Q5)	0.368		0.0	1.0
Semi-skilled (Q6)	0.271		0.0	1.0
Unskilled (Q7)	0.148		0.0	1.0
Apprentices (Q8)	0.130		0.0	1.0
Average Hourly Earnings (AHE)	5.097	0.44	3.89	7.49
Number of Observations	56979			
Average Hourly Earnings inc OT (AHEIOT)	5.099	0.44	3.89	7.49
Average Hourly Base Wages (AHBW)	5.026	0.41	3.87	7.40
Average Monthly Base Wages (AMBW)	10.103	0.46	7.91	12.40