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Part-Time Wage-Gap in Germany: Evidence across the Wage Distribution

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Abstract

This paper uses insights from labour-market segmentation theory to investigate the wage differences between part-time and full-time workers in Germany at different parts of the wage distribution. This is accomplished with the use of a quintile regression and panel data from the SOEP (1991-2008). To get more insight on the part-time wage-gap, we apply a counterfactual wage decomposition analysis. The results show that, in the lower end of the wage distribution, part-time workers receive lower returns for their labour market characteristics, indicating the segmentation of the labour market. In contrast, at the top of the wage distribution, the part-time wage gap is fully explained by the difference in the characteristics of part-timers and full-timers.

Keywords: part-time employment, wage gap decomposition, labour market segmentation

JEL codes: J31, J42, C21

1. Introduction

The rapid growth of part-time employment in Europe the last 30 years has come as a response to the need of employers for more flexibility but also, to a certain extent, to the need of workers for life-work balance reconciliation. At the positive side, part-time employment is associated with a large increase in female labour force participation. At the negative side, part-time employment may come at a cost as personal resources remain partly unutilized and investments in human capital are reduced for part-timers. This results in a well-known part-time wage penalty (Blank, 1990; Dekker, Muffels, & Stancanelli, 2000; Gornick & Jacobs, 1996; Manning & Petrongolo, 2008; OECD, 1999; Russo & Hassink, 2008).

The aforementioned considerations for part-time employment become more relevant for countries with rigid labour markets, such as Germany. In these countries, part-time employment, as a form of atypical employment, carries a more negative connotation and thus, a stigma for the worker. In the last decades, Germany has been on a gradual path to make its labour market more flexible (Hevenstone, 2010). The result of this process is that the incidence of part-time employment in Germany is among the highest within OECD countries. Specifically, in 2009, 8% of the German male workers and 38.1% of the female workers was employed part-time (OECD, 2010). Despite the legislative efforts to equalize the rights of part-time workers with full-time workers, the former face a 6% wage penalty compared to their full-time colleagues (McGinnity & McManus, 2007).

The average wage penalty, however, ignores the fact that part-time work is very heterogeneous. This heterogeneity stems from the fact that part-time employment encompasses both 'good' and 'bad' jobs: skilled workers and professionals next to workers in low-wage and low-status jobs (Kahne, 1992). An approach that considers average effects treats equally a low-wage cleaner with a highly paid advisor that both work part time. This heterogeneity is only partly taken away when, as most studies do, controlling for human capital and job characteristics. Previous research has shown

that, even within jobs and within groups of individuals with similar skill levels, part-time work differs considerably according to several characteristics such as the type of the employment contract, the number of working hours, the position in the workplace, the strength of the trade unions and the preferences of the employer (Barling & Gallagher, 1996; Jenkins, 2004; O'Reilly & Fagan, 1998; Walsh & Deery, 1999). These considerations are even more valid for Germany as, in the absence of a statutory minimum wage, there are sometimes different wage regulations for workers in the same occupation and with the same characteristics.

Regardless of the exact source of the heterogeneity of part-time work, the result is that in a good-quality part-time job the worker is highly remunerated, while in a bad-quality part-time job, he receives a low wage. Therefore, the wage level can serve as a good proxy that encompasses the characteristics that describe the quality of the part-time job. Wahlberg (2008) offers some preliminary evidence for Sweden that that the part-time wage-gap differs across pay levels. However, this research is far from being complete, while it has not been carried out in other countries.

The aim of this paper is to investigate the part-time wage-gap across the wage distribution in Germany. To distinguish between net wage differences that are attributed to part-time employment and wage differences that emerge due to the different composition of full-timers and part-timers, we employ a counterfactual decomposition on a quintile regression (Machado & Mata, 2005; Melly, 2007).

The paper is organised as follows: section 2 gives an overview of relevant theoretical considerations. Section 3 introduces the importance of the socio-economic context and proceeds to summarize the main facts in the German labour market and their effect on the wage levels of part-time workers. Section 4 outlines the data and the method used in this study. The results of the subsequent analysis with additional robustness tests are presented in section 5. The conclusions of the paper as well as the possible relevance of the main findings to future research and social policy are discussed in section 6.

2. Theoretical considerations

The part-time pay gap is typically explained by economic theoretical approaches such as the human capital theory and the theory on quasi-fixed costs and by sociological theories, such as preferences theory and the gender role model (Biddle & Thomas, 1966; Hakim, 2007; Tijdens, 2002). However, the standard considerations of these theories cannot account for differences in the part-time pay gap that emerge between different parts of the wage distribution. To explain these differences, we have to turn to labour market segmentation theories.

Theories on labour market segmentation may play an important role in explaining the part-time wage-gap (Aaronson & French, 2004; Ermisch & Wright, 1992; Hardoy & Schøne, 2006; Jepsen, O'Dorchai, Plasman, & Rycx, 2005; Rodgers, 2004; Wolf, 2002). Here, we complement these theories with considerations from the theory on quasi-fixed costs to derive hypotheses on the variation of the part-time wage-gap across the wage distribution.

2.1. Segmentation theories

Labour market segmentation theories (see e.g. Doeringer & Piore, 1971; Edwards, 1979) suggest that the labour market is divided into two segments that differ in terms of job quality, remuneration and employment stability. In the primary segment, workers enjoy good working conditions, job or employment stability, high wages and good promotion opportunities. In contrast, in the secondary segment, precarious jobs with low security, low wages and scarce promotion opportunities are widespread.

Segmentation theories are relevant in explaining heterogeneity in part-time employment. Tilly (1991, 1992; 1996) and Walsh (1999) suggest the existence of a dualism in part-time employment. Specifically, they make a distinction between *retention* and *secondary* part-time jobs. Good or *retention* part-time jobs are created to keep a company's valued, mostly skilled employees, whose life circumstances prevent them from working full-time. One could add here the high-skilled part-time jobs that

cover specific and usually temporary needs of companies (i.e. advisors). Retention part-time jobs are located in the primary labour market and are occupied voluntarily by workers. Bad or *secondary* part-time jobs that outnumber the retention part-time jobs are found in the secondary segment of the labour market. One could argue that workers are employed involuntarily in these jobs. However, as the preferences theory or the role theory would suggest, this may not be the case. Many workers − mostly females − that are second breadwinners in the household, may value less the wage and the working conditions and accept such a part-time job. Therefore, part-time employment has a very different function at the two ends of the wage distribution. In low-wage jobs, part-time work serves as an indicator of the secondary segment of the labour market. In contrast, in high-paid jobs, part-time work is less of an indicator of the labour market segment.

In more detail, dual labour market theory maintains that part-time jobs are concentrated more in the secondary labour market making them more vulnerable (Hagen, 2002). The growth of part-time employment has occurred in the context of globalization, outsourcing and the subsequent change in employers' labour-use strategies, e.g. adjusting to business cycles (Buddelmeyer, 2008). In companies with a low technology base and high dependence on the fluctuation in market demand, a small number of 'core', full-time workers is needed to keep the company going, while production/service delivery could be managed by atypical employment (Lambert, 2008). Such part-time jobs are usually covered by population subgroups with poor labour market integration, such as female workers and immigrants. Workers from such groups typically have lower negotiation power and receive lower wages (Ermisch & Wright, 1992).

A different picture emerges in the primary sector of the labour market. In this sector, many firms, especially in the public sector, are responsive to the needs of workers for less working hours (Tijdens, 2002). These firms adjust their labour use strategies according to part-time work and thus, no part-time wage gap emerges. Moreover, in high-paid jobs in dynamic, innovative firms − e.g. ICT companies − that

require specific skills flexible working hours may be encouraged (Boockmann & Hagen, 2001). Hiring high-paid experts for specific tasks on a part-time basis would be an opportunity for the firm to minimize the overall costs as there may not be enough work for a full-timer. In this case, the firm may offer even a higher hourly wage to the part-time expert than to his full-time colleague. Therefore, in such jobs there is no reason for a part-time wage-gap to exist.

2.2. Labour demand theory and quasi-fixed costs

The relationship between the working hours and the hourly wage is affected by the *quasi-fixed costs* that are related to paid employment and by the fluctuating levels of productivity during the working day. These costs are related to hiring, training, administrating, coordinating and monitoring workers, as well as to the 'start-up' effect and the 'fatigue effect' (Barzel, 1973; Gregory, 2010). If these costs are high, it becomes preferable for employers to hire people on full-time capacity and with a higher wage instead of relying on part-time workers (Montgomery, 1988).

Quasi-fixed costs are typically higher for high-skilled and high-paid jobs. Costs related to hiring and initial training are much higher for high-skilled – and therefore high-paid – jobs than for low-skilled jobs. Coordination costs are also higher for managerial jobs than for low-paid jobs. Employing part-time managers would be too expensive for companies as this would require an increased investment in hiring and training as well as inefficiency due to the supervision of full-time workers by part-time managers. If such managers are indeed hired, companies may compensate for the high fixed costs by offering them a lower wage (Rosen, 1976).

With the face of *Janus*, the argument reverses when we focus on the other end of the wage distribution: the lower the associated quasi-fixed costs of employing workers, the more preferable it is to employ part-time workers if that can be achieved at a lower cost. The theory of quasi-fixed costs would suggest that low-paid jobs are mainly simple, unskilled jobs where hardly any fixed costs apply while high-paid jobs are skilled jobs with many related fixed costs. Thus, according to quasi-fixed costs,

we expect the part-time wage-gap to be smaller at the lower end of the wage distribution. Consequently, we expect different effects of part-time employment on wages at the different parts of the wage distribution.

3. Socio-economic context and the German labour market

The upsurge of part-time employment has been connected to the growing needs for flexibility, especially in times of uncertainty (O'Reilly & Fagan, 1998). However, working-hours supply is also influenced by institutional factors: employment protection, tax incentives, availability of child care and elderly-care provision (Gash, 2008; Schmid, 2010).

Germany is an example of a corporatist welfare state in the typology of Esping-Andersen (1990) or a coordinated market economy (Hall & Soskice, 2001: 39) with cooperative capital-labour relations and bargained moderation in wage setting (Ebner, 2010). Already after the II World War the German labour market headed for the '*Normalarbeitsverhältnis*,' i.e. the standard employment relationship: full-time job with protection against dismissal, status protection and most importantly collective wage setting well above the subsistence level (for an overview of German employment model, see Eichhorst, 2011). The German labour market tightly links educational credentials with job requirements (Gangl, 2004; Gangl, Müller, & Raffe, 2003). Educational credentials and labour market experience account for a large part of the earnings progression over the life cycle (Trappe & Rosenfeld, 1998). The German labour market is a typical 'insiders' labour market, where 'core' workers in the primary segment enjoy a high level of job protection and higher wages, while their counterparts in the secondary segment are much less protected and much more exposed to atypical employment (Giesecke, 2009). Long-term and full-time employment relations are typical for the primary segment of the labour market, while flexible contracts and part-time employment are widespread in the secondary segment.

In the last 20 years, developments in the German labour market have strengthened some of the aforementioned characteristics. As employment protection remained high, employers turned to internal flexibility arrangements, with part-time work having a leading role (Keller & Seifert, 2005). Restrictions for atypical employment started to be lifted in the 1990s. Consequently, between 1992 and 2006, part-time work in West Germany grew over 80%, while full-time employment decreased by 15% (Klinger & Wolf, 2011). Furthermore, recent labour market reforms in Germany, such as the Hartz reforms and the creation of 'mini-jobs' in the 2000s, have been associated with the expansion of regular part-time work (Schmid & Modrack, 2008), but also with the sharp increase of part-time work in the unregulated and low-wage section of the labour market (Bosch & Kalina, 2008; for an overview of state reforms regarding low paid work see Caliendoa & Wrohlichb, 2010; Eichhorst, 2011; Palier & Thelen, 2010). Since the early 1990's, a wage-gap for part-timers emerged. In the mid-1990s, the median hourly earnings of part-time workers were only 83% of the full-time equivalent (OECD, 1999). Despite this rise, the part-time pay gap in Germany remains lower than in other countries. For instance, Manning & Petrongolo (2008) suggest that this gap in 25% in the UK, while McGinnity & McManus (2007) find a 6% gap in Germany.

The relatively low part-time wage gap in Germany may be explained by wage regulations and legislation about equal treatment of part-timers. However, the fact that collective bargaining does not cover workers universally in most sectors may actually explain why this part-time wage gap exists. More specifically, in Germany, there is no statutory minimum wage. Nevertheless, collective bargaining sets minimum pay arrangements for the covered firms (Bosch & Weinkopf, 2010). In addition, binding minimum wages are set in some economic branches and occupations, such as construction, electrical work, janitors, roofers and painters. Minimum pay regulation affects merely the wages of the low paid, while also equalizes the hourly compensation between the low-paid part-timers and full-timers. The result is that both the level of the wage of low-paid part-timers and the wage difference between low-

paid part-timers and low-paid full-timers may vary within the same sector as some firms are covered by collective bargaining while others are not.

3.1. Hypotheses

The theoretical framework and specific characteristics of the German labour market suggest that the wage-gap between part-time and full-time workers varies between the different parts of the wage distribution and that this wage-gap cannot be fully explained by differences in socio-demographic or employment related characteristics between full-timers and part-timers (hypothesis 1). Contradicting hypotheses can be derived considering the direction of this variation. According to the dual labour market theory, the part-time wage-gap is larger at the lower tail of the wage distribution as low-wage part-timers work in firms or jobs where accumulation of human capital is not rewarded (hypothesis 2a). In contrast, theory on quasi-fixed costs suggests that the part-time wage-gap is higher at the top of the wage distribution where fixed employment costs are higher (hypothesis 2b).

4. Research method and data

4.1. Dataset and description of main variables

To explore the part-time wage penalty in Germany, the German Socio-Economic Panel (SOEP) is used (Wagner, Frick, & Schupp, 2007). To include also data from East-Germany, observations from the period 1991-2008 are analysed. Although there are differences between East- and West-Germany, this regional aspect is incorporated into the analysis to examine the developments in Germany after the reunification.

The sample is restricted to workers between 18 and 55 years old. In accordance with OECD, part-time employment is defined as working 30 hours a week or less. The self-employed and the apprentices are excluded from the sample. Individuals working less than 10 hours weekly are omitted to exclude occasional workers with very low attachment to the labour market. After these corrections, the

average actual weekly working hours in our sample amount to 21.9 for part-timers and 42.7 for full-timers.

The dependent variable in our analysis is the natural logarithm of the gross hourly wage. The hourly wage is calculated using the last month's gross earnings from paid employment and the actual working time per week. For years prior to 2002, wages are transformed to euros. Wages are also adjusted with the Consumer Price Index. Extreme values (the upper 30% of the 99th percentile and lowest 70% of the 1st percentile) of the hourly wage are dropped. Our final database consists of 86,999 observations of which 72,761 (83.6%) refer to full-time workers and 14,238 (16.4%) to part-time workers.

Our list of control variables includes, gender, age, marital status, educational attainment, nationality, health status, the age of the youngest dependent child, firm size, occupation according to the 4-digit ISCO-88 classification, industrial sector, the type of the employment contract and dummies for East Germany, for having experienced an unemployment spell in the year prior to the survey and for having followed training in the year prior to the survey. Finally, we also include year dummies to control for the business cycle. Descriptive statistics of control variables in our sample are provided in table 1.

[Insert Table 1 here]

4.2. Method

Previous research as shown that the analysis of atypical employment can be sensitive to the estimation models (see, e.g. Mertens & McGinnity, 2005); especially, in the presence of differing quality of available jobs across the wage levels. Thus, to estimate the effect of part-time work across the wage distribution in Germany non-parametric quantile regression approach is used (Koenker & Basset, 1978; Koenker &

D'Orey, 1987; Koenker & Hallock, 2001).[1] The regression model of the wage y_i for quintile θ can be expressed as:

$$Q_\theta(y_i | X_i) = \alpha(\theta) + X_i \beta_\theta, \quad \theta \in (0,1)$$

where the y_i is the log hourly wage of the person i, X_i represents the vector of covariates and a, β_θ are the coefficients to be estimated. X_i is perceived as a linear function of the covariates, while the model specifies the θth quantile of the conditional distribution of the log hourly wage. We obtain consistent standard errors by using pair-wise design-matrix bootstrap with 500 replications (see an overview of calculating the covariance matrixes M. Buchinsky, 1995; M. Buchinsky, 1998).

To exemplify further the differences between part-time and full-time workers, we apply a wage decomposition similar to the Oaxaca-Blinder decomposition (Blinder, 1973; Oaxaca, 1973). The principle of this method is that the part-time wage gap is decomposed into a component that is due to the different composition of the two groups and a component that is related to the return to the characteristics of the two groups. As, in a quantile regression, the vectors of the explanatory variables and the individual error terms make the wage estimates conditional to the specific quantile, the standard Oaxaca-Blinder decomposition cannot be applied. In recent years, Machado and Mata (2005) have proposed a decomposition procedure that incorporates bootstrap to quantile regression. This method is based in the probability integral transformation theory (Melly, 2005), which is used to estimate the wage density. Melly (2007) and Chernozhukov et al. (2009) proposed a modified procedure of Machado and Mata's (2005) decomposition by estimating a quantile regression for a selected number of quantiles of the log wage. This procedure yields essentially the same results as the approach proposed by Machado and Mata, while not relying solely

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[1] The quintile regression treats the data as repeated cross sections. We would have preferred to use a comparable fixed-effects panel regression to estimate better the causal effect of part-time employment. However, this technique is at the moment nascent and suffers by many drawbacks, such as the limited number of covariates that can be used in the models. We tested the sensitivity of our results by restricting the analysis to a single cross section but this did not change the main findings of this study. Results are available at request.

on simulation-based estimation. According to this approach, the estimator of the θth unconditional quantile (from $j = 1, \ldots, J$) can be expressed as follows:

$$q(X_i, \beta_\theta, \theta) = \inf \left\{ q : \frac{1}{N} \sum_{i=1}^{N} \sum_{j=1}^{J} (\theta_j - \theta_{j-1}) 1 \left(x_i \beta_{\theta_j} \leq q \right) \geq \theta \right\}$$

where 1 is the indicator function.

Afterwards, a counterfactual distribution of the wage gap is performed by replacing the estimated parameters of the distribution of characteristics of full-time workers with those of part-time workers. This can be noted as follows:

$$q\left(X_i^p, \beta^t, \theta\right) - q\left(X_i^f, \beta^f, \theta\right) = \left[q_\theta \left(x^p, \beta_\theta^p \right) - q_\theta \left(x^p, \beta_\theta^f \right) \right]$$

$$+ \left[q_\theta \left(x^p, \beta_\theta^f \right) - q_\theta \left(x^f, \beta_\theta^f \right) \right]$$

$$+ residual$$

where p denotes part-time and f fulltime.

As shown in the last equation, at each quantile, the difference of the unconditional distributions can be divided into two components. The first component represents the difference in labour market characteristics of the two groups – the *characteristics'* effect, while the second component represents the differences between the rewards that the two groups obtain from their labour market characteristics – the *coefficients'* effect. Thus, the second component is the unexplained part of the part-time wage-gap for the specific quantile. The underlying assumption of this model is that the residual term disappears if the linear regression model is accurately specified and if we use a sufficiently-high number of simulations (Melly, 2005).

In the aforementioned decomposition, any omitted variable or error in the measurement become part of the coefficients' effect and increase the unexplained part

of the part-time wage gap. This is a well-known problem of the Oaxaca-Blinder decomposition. However, this is less of a problem for the quintile counterfactual decomposition. The reason for this is that the quintile regression estimates the returns for the characteristics within each quantile separately, which improves the precision in the estimation of explained and unexplained component of the wage-gap (Gregory, 2010).

5. Results

5.1. The effect of part-time work across the wage distribution

As shown in table 1, the average hourly wage of a part-time worker in our sample is 12.2 Euros while the full-time equivalent is 13.9 Euros. To get a smooth representation of the distributions of the hourly wage of part-time and full-time workers, kernel density estimates are plotted in figure 1. This graph illustrates that the wage distribution of full-timers is highly concentrated around the mode. In contrast, part-timers have a somewhat higher dispersion of their density function as well as several peaks.

[Insert Figure 1 here]

The results of the pooled OLS and the quantile regressions are presented in table 2. The OLS regression shows that part-time workers receive on average a 5.7% lower wage than their full-time colleagues. This concurs with the findings of Fouarge and Muffels (2009), who suggest that the part-time wage-gap in Germany is smaller than in other countries. However, the picture becomes different if we investigate the part-time wage-gap in the various part of the wage distribution.

[Insert Table 2 here]

Figure 2 gives a graphical illustration of the estimates for the part-time wage gap that are presented in Table 2. The estimated wage-gap is presented together with the 95% confidence interval. Figure 2 shows that, controlling for other covariates, a

decreasing wage-gap between part-timers and full-timers emerges when we move from the lowest to the highest conditional income quantiles. Actually, the wage penalty reverses into a small wage premium when we reach the top decile. In more detail, at the bottom of the distribution (10th percentile), the wage-gap is around 16.8% to the disadvantage of part-time workers. The wage-gap presents the following trend as we move to higher deciles: -12.1% in the 20th percentile, -8.9% in the 30th, -6.6% in the 40th, -4.8% in the median, -3.0% in the 60th and -1.8% in the 70th percentile. These results are in line with the 1st hypothesis: there is a significant part-time wage penalty that varies considerably across the wage distribution after controlling for socio-economic and employment-related characteristics. In accordance with hypothesis 2a, the wage-gap disappears for part-timers at the higher wage quantiles: the wage-difference between full-timers and part-timers becomes not significant in the 80th percentile and increases to 3.4% to the benefit of the part-time workers in the 90th percentile).[2]

[Insert Figure 2 here]

All in all, the results from the quantile regressions seem to favour more the segmentation theory than theory on the quasi-fixed costs. At the lower end of the wage distribution, part-time jobs may be characterised as 'bad' jobs or jobs belonging to the secondary labour market where skills' accumulation is not rewarded (hypothesis 2a). The extent of the part-time wage-gap at the bottom of the distribution hints to the fact that in the highly segmented German labour market, low-wage part-time workers are more easily marginalised and are typical 'outsiders'. In contrast, in high-wage jobs, working part-time is not associated with a wage penalty, suggesting that in the primary segment of the labour market part-time jobs are not 'bad jobs'.

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[2] The aforementioned results may be biased due to non-random selection into part-time employment. To investigate this selection into part-time work, we estimate an IV-quantile regression using the ability to start a new job as an instrument. Our instrumental variable strategy shows higher returns to part-time employment, especially in the lower end of the wage distribution. The size of these returns fluctuates across the distribution. However, our instrument is probably week as it has large standard errors. Thus, the endogeneity of part-time employment cannot be rejected. Unfortunately, the SOEP lacks suitable instrumental variables, especially data on individuals' opinions that are considered optimal for such an IV-estimation.

We should stress here that contrary to previous studies that focussed on mean effects of part-time employment (Bardasi & Gornick, 2008; Manning & Petrongolo, 2008), the estimated part-time wage-gap is not sensitive to occupational differences. Our models were also estimated without occupation as a covariate and no drastic change of the part-time wage-gap emerged. [3]

5.2. Counterfactual wage decomposition

To further quantify and understand the wage-gap between part-time and full-time workers, a counterfactual wage decomposition is performed. The results of this decomposition are presented in table 3. The first column of this table presents the average ('raw') wage gap before controlling for other characteristics in every quintile. The second and the third column present the two effects that are estimated per quintile by the counterfactual wage decomposition: the characteristics' effect and the coefficients' effect. Table 3 indicates that not only the size of the part-time wage, but also its source differs across the various parts of the wage distribution. More specifically, at the very bottom of the distribution (10th percentile), the 'raw' wage-penalty for part-time employment amounts to 3%. However, this relatively small wage-gap is the result of a large equalizing characteristics' effect (11.7%) and an even larger diverging coefficients' effect (-14.7%). It seems that part-time workers at the very bottom of the wage distribution have 'better' socio-economic and labour market characteristics compared to full-time workers in the same wage quantile. The reward to personal and job characteristics remains equally large (-13%) in the 20th percentile, while the equalizing characteristics' effect disappears. As we move to higher deciles of the wage distribution, the characteristics' effect becomes gradually more important (-4.3% to -12.7% from the 30th to 80th percentile of the wage distribution) and reinforces the wage gap in favour of the full-timers. In contrast, the coefficients' effect, which indicates the possible existence of discrimination against the part-timers, becomes steadily smaller as we move from the bottom to the top of the distribution.

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[3] These estimation results are available on request.

Essentially, at the top quintile, the wage difference derived from the returns to labour-market characteristics is non-existent.

[Insert Table 3 here]

All in all, the wage decomposition shows that the different composition of part-timers and full-timers can explain a large part of the part-time wage gap in many parts of the wage distribution. In fact, at the top deciles, this different composition can almost fully explain the wage gap. In contrast, the 'residual' wage gap that cannot be explained by the different composition of the two groups is mostly important at the bottom of the distribution and non-existent at the top of the distribution.

A comment on the different direction and size of the two components at the various parts of the wage distribution is necessary. It seems that workers with characteristics that produce high wage returns are overrepresented among part-timers at the bottom of the distribution. This points to the role of individual preferences in labour-market participation. Several individuals with high-earnings potential value the possibility to work part-time more than earnings. However, these individuals pay a price for their choice as their characteristics are not equally remunerated compared to their full-time colleagues. The lower remuneration of characteristics reduces to almost zero as we move to the top deciles. Considering that a broad range of characteristics is included in the decomposition, this reinforces the conclusion that a part-time job is a 'bad' job at the bottom of the distribution but not at the top of the distribution.

5.3. Robustness checks

In this section, we apply three robustness checks to investigate the validity of our main results. Firstly, we restrict our analysis to female workers. The reason is that part-time jobs are largely concentrated among women, as women use this form of employment to achieve their optimal work-life balance. Secondly, we use the full sample and distinguish between voluntary and involuntary part-time employment. Finally, we use again the full sample to study the effect of part-time employment

when accompanied by a job change. The main results of these robustness analyses are presented in table 4.

[Insert Table 4 here]

The quantile regression for women – regression 1 – shows that the main results of our analysis persist when we restrict our sample to female workers. A considerable wage-gap emerges at the lower quantiles that reduces as we move to the top quantiles. This wage-gap disappears when we look at the 7th quantile and turns into a wage premium at the highest quantile. The decomposition of the wage-gap[4] shows that, at the lower wage quantiles, the socio-economic characteristics reduce considerably the wage-gap, while in the upper wage quantiles (from the 6th to the 9th quantile) the effect is not present. In contrast, the difference in the reward of the socio-economic characteristics (coefficients' effect) increases the wage penalty for part-time employment at the lower quantiles while it is practically non-existent at the higher quantiles.

The second part of Table 4 – regression 2 – presents the results from a quantile regression on the full sample where we distinguish between voluntary and involuntary part-time employment. We define part-time employment as involuntary when the desired working hours of the respondent are higher than the actual working hours at the time of the survey. The results indicate that, at all quantiles, the wage penalty for part-time work is higher when part-time employment is involuntary. Moreover, for involuntary part-time employment, the differences in the wage penalty between the various quantiles are more pronounced. However, the overall pattern remains the same with our main results.

The third and final part of table 4 – regression 4 – presents the results from a quantile regression on the full sample where part-time employment is interacted with a variable indicating whether the respondent has changed an employer or a job with the same employer in the year prior to the survey. The results indicate that the penalty for part-time employment is larger for workers that recently changed employers than

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[4] The results are available at request.

workers that remained in the same job. However, for workers that changed jobs in the same firm, the part-time wage-gap is the same as with the ones that remained in the same job. Once more, these results follow the same pattern with the results of our main analysis.

6. Conclusions

This paper investigated the part-time wage gap in Germany by using the wage level as a proxy that captures a large part of the heterogeneity in part-time employment. By employing a quantile regression, we found that the part-time wage-gap is larger in the lower part than in the higher part of the wage distribution. The counterfactual wage decomposition revealed that the source of the wage-gap differs also significantly between the bottom and the top of the wage distribution. At the bottom of the distribution, the part of the wage-gap that is due to differences in the returns of the socio-economic and job characteristics between part-time and full-time workers is dominant. In contrast, at the top of the distribution, the part time wage-gap is almost entirely produced by differences in the observed characteristics between part-timers and full-timers. Additional analysis showed that our main results are not sensitive to gender, the voluntary nature of part-time employment or a possible job change. However,

This study confirms the heterogeneous nature of part-time employment. Employers offer part-time jobs to adjust to non-standard needs of output. However, their decision to 'penalize' part-timers with a lower wage depends on various factors. If the complexity and the structure of the job increase, the cost of using part-time employment increases accordingly. Sometimes, it may be just the perception of the employer about the job that matters. In a labour market where long-term standard employment relationships are valued, part-time contracts are offered for low-paid jobs that are less important for employers. For all these reasons, part-timers may receive a lower wage than their full-time colleagues.

Workers accept part-time jobs according to their needs but also according to their preferences in order to achieve their optimal work-life balance and combine employment with other activities. The latter means that some workers may even accept a lower hourly wage provided that they can maintain their optimal number of working hours.

Finally, demand for part-time work cannot always be considered exogenous. The increased willingness of workers to work part-time may induce firms to increase their demand for part-time employment as they think that, in this way, they will attract applicants with better skills.

Labour market regulation does not leave these processes unaffected. When the wage setting is regulated by law or collective bargaining, penalizing the part-timers with a lower wage is difficult. In a labour market where no statutory minimum wages exist and collective bargaining does not cover all firms, the heterogeneity that is produced by regulation is even larger.

Our results indicate that ignoring the differences between the various parts of the wage distribution and focussing on average effects that has been the dominant approach in the literature, conceals the very different function of part-time employment at the various strata of the wage distribution. Actually, explanations based on job quality seem to matter more in the determination of the part-time wage gap than the costs related to the use of part-time work. In theoretical terms, this means that we should derive explanations for the part-time wage gap from labour market segmentation theory and less from economic theory on quasi-fixed costs.

Understanding the causes of the part-time wage-gap is also necessary to calibrate labour market policies that introduce more flexibility. Our results indicate that part-time employment is strongly related to the segmented nature of the German labour market. At the bottom of the distribution, part-time is considered as an inherent characteristic of a bad job, while at the top of the distribution part-time jobs are more likely to be good jobs. However, except for labour market segmentation, individual

preferences for work-life balance play an important role. More specifically, some individuals with high earnings potential seem to value other activities more than employment and they accept working in low-paid part-time jobs where they face a wage penalty compared to their full-time colleagues.

From a policy perspective, the aforementioned findings suggest that Germany has to concentrate more on the risk groups and especially on the low-wage part-timers. Thus, recent reforms in the German labour market towards flexibility and encouraging part-time work (that in effect may result in low-skilled work) could subsidise the locking into low-wage employment (see on this topic e.g. Kyrrä , Parrotta, & Rosholm, 2009; Van Ours, 2004). This could be an area in which regulation for labour protection could have an effect.

This analysis should be refined with development of fixed effects quantile regression that will allow the further identification of the causal effects of part-time employment. As the current version of these methods does not allow the inclusion of many covariates, we left this as an issue for further research.

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Table 1. Descriptive statistics

Variables	Categories	Full-time	Part-time	Total
		Mean (Std) or %		
Real gross hourly wage	Cont. variable (Euros)	13.913 (7.035)	12.183 (6.778)	
Nr of children	Cont. variable	0.518 (0.850)	0.733 (0.908)	
Actual hours worked	Cont. variable	42.755 (5.519)	21.847 (6.117)	
Tenure	Cont. variable (years)	10.375 (9.908)	8.873 (8.869)	
Sex	Man (woman reference category)	62.84%	8.81%	54.00%
Married	Yes (no reference category)	57.54%	75.28%	60.45%
Age of the youngest child	No children (reference category)	63.35%	46.76%	60.64%
	Preschool(0-6)	12.08%	14.95%	12.55%
	Pre-teens(7-12)	13.48%	22.36%	14.93%
	Teenagers (13-16)	11.08%	15.94%	11.88%
Education *(based on ISCED codes: 6 (high), 3–5 (medium), and 1–2 (low))*	Low education	14.41%	13.92%	14.33%
	Medium education	63.05%	67.90%	63.84%
	High education (ref. category)	22.54%	18.18%	21.82%
Severely handicapped	Yes (no reference category)	4.36%	3.95%	4.30%
Nationality	Non-German (German reference category)	9.28%	7.71%	9.03%
Region	East-Germany (West-Germany reference category)	29.50%	16.95%	27.45%
Temporary contract	Yes (permanent contract reference category)	13.78%	12.22%	13.52%
Received training prev. year	Yes (no reference category)	8.76%	1.79%	7.62%
Unemployment experience (prev. year)	Yes (no reference category)	6.17%	6.55%	6.23%
Firm-size (nr of employees)	Micro firm (<20)	5.49%	12.65%	6.66%
	Small firm (20-199)	45.92%	51.07%	46.77%
	Medium firm (200-1999)	23.99%	17.12%	22.86%
	Large company (=>2000) (reference category)	24.60%	19.16%	23.71%
Sector *(based on NACE categorization)*	Primary sector	2.45%	2.09%	2.39%
	Secondary sector	39.74%	12.94%	35.35%
	Tertiary sector (service industry)	34.22%	43.78%	35.78%
	Public services (health, education and defence) (reference category)	23.60%	41.18%	26.48%
Occupation *(based on the*	Legislators, senior officials and managers (reference	5.72%	1.11%	4.96%

highest categories of the ISCO-88 4-digit occupational categorization)	category)			
	Professionals	15.82%	13.37%	15.42%
	Technicians and associate professionals	22.62%	27.6%	23.43%
	Clerks	11.78%	19.98%	13.12%
	Service, sales and skilled agricultural workers	9.32%	21.24%	11.27%
	Craft and trade workers	20.27%	2.62%	17.38%
	Plant and machine operators	9.38%	2.02%	8.18%
	Elementary occupations	5.1%	12.07%	6.24%
Number of observations (N)		72,761	14,238	86,999

Source: Authors, GSOEP sample of 1991-2008.

Table 2. Selection of estimates for OLS and quantile regressions (10th - 90th quantile (standard errors in parenthesis))

	OLS	Q.10	Q.20	Q.30	Q.40	Q.50	Q.60	Q.70	Q.80	Q.90
Part-time (full-time ref.)	-0.059***	-0.184***	-0.129***	-0.093***	-0.068***	-0.049***	-0.030***	-0.018***	-0.003	0.033***
	(0.007)	(0.01)	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)
Man (woman ref.)	0.154***	0.156***	0.142***	0.139***	0.140***	0.141***	0.146***	0.148***	0.154***	0.171***
	(0.006)	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Low education	-0.309***	-0.256***	-0.256***	-0.262***	-0.273***	-0.276***	-0.287***	-0.297***	-0.303***	-0.324***
	(0.01)	(0.009)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.007)	(0.008)
Medium education	-0.176***	-0.149***	-0.151***	-0.155***	-0.163***	-0.165***	-0.167***	-0.176***	-0.186***	-0.207***
	(0.008)	(0.007)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)
Temp. contract (permanent ref.)	-0.299***	-0.473***	-0.353***	-0.291***	-0.272***	-0.263***	-0.246***	-0.228***	-0.199***	-0.162***
	(0.007)	(0.017)	(0.01)	(0.01)	(0.008)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)
Region (W.-G. ref.)	-0.275***	-0.315***	-0.309***	-0.300***	-0.287***	-0.277***	-0.268***	-0.266***	-0.256***	-0.241***
	(0.006)	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Primary sector	-0.109***	-0.169***	-0.133***	-0.121***	-0.122***	-0.109***	-0.087***	-0.083***	-0.070***	-0.034
	(0.015)	(0.017)	(0.011)	(0.01)	(0.009)	(0.009)	(0.009)	(0.009)	(0.01)	(0.014)
Secondary sector	0.027***	0.013	0.018***	0.024***	0.027***	0.033***	0.042***	0.049***	0.058***	0.068***
	(0.006)	(0.007)	(0.005)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.006)
Tertiary sector	-0.046***	-0.090***	-0.078***	-0.064***	-0.056***	-0.047***	-0.031***	-0.016***	0.002	0.026***
	(0.006)	(0.006)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)
	2.047***	1.512***	1.838***	1.993***	2.084***	2.140***	2.218***	2.320***	2.474***	2.751***
Constant	(0.036)	(0.063)	(0.041)	(0.035)	(0.03)	(0.031)	(0.029)	(0.032)	(0.035)	(0.034)
R^2(OLS)/Pseudo R^2 (QR)	0.6312	0.479	0.449	0.427	0.408	0.392	0.379	0.368	0.360	0.351

* $p<0.05$, ** $p<0.01$,*** $p<0.001$

Additional control variables in the model were age, marital status, nationality, health status, the age of the youngest dependent child, firm size, occupation, unemployment experience and training and control for business cycles.

Table 3. Decomposition of part-time wage-gap based on the conditional model

	Raw wage-gap (Std.)	Characteristics effect (Std.)	Coefficients effect (Sdt.)
Q.10	-0.030	0.117	-0.147
	(0.010)	(0.008)	(0.009)
Q.20	-0.129	0.001	-0.130
	(0.006)	(0.004)	(0.006)
Q.30	-0.150	-0.042	-0.109
	(0.005)	(0.004)	(0.005)
Q.40	-0.155	-0.065	-0.090
	(0.004)	(0.003)	(0.005)
Q.50	-0.155	-0.081	-0.074
	(0.004)	(0.003)	(0.004)
Q.60	-0.153	-0.093	-0.060
	(0.005)	(0.003)	(0.004)
Q.70	-0.151	-0.104	-0.046
	(0.005)	(0.003)	(0.004)
Q.80	-0.149	-0.119	-0.030
	(0.005)	(0.004)	(0.004)
Q.90	-0.137	-0.143	0.005
	(0.007)	(0.004)	(0.006)

No. of obs. in the reference group 72761

No. of obs. in the counterfactual group   14238

Table 4. Additional robustness checks

	Q.10	Q.20	Q.30	Q.40	Q.50	Q.60	Q.70	Q.80	Q.90
Regression 1. (women-only sample)									
Part-time (full-time ref,)	-0,106***	-0,070***	-0,046***	-0,030***	-0,020***	-0,006***	-0,001	0,005	0,022*
Regression 2. (full sample)									
Part-time work interaction with working under preferred number of hours (involuntary)									
Part-time (full-time ref,)	-0,137***	-0,100***	-0,069***	-0,050***	-0,030***	-0,018***	-0,008	0,001	0,036**
Involuntary (working as many hours or more as preferred ref.)	0,029*	0,021	0,015	0,011	0,009	0,009	0,002	0,002	0,002**
Involuntary x part-time	-0,155***	-0,110***	-0,089***	-0,070***	-0,070***	-0,053***	-0,035***	-0,023*	-0,020
Regression 3. (full sample)									
Job change added to the full sample + interaction with part-time quantile regression									
Part-time (full-time ref,)	-0,161***	-0,110***	-0,078***	-0,060***	-0,040***	-0,022***	-0,012	0,003	0,039
Job change new employer (no change ref.)	0,014**	0,033***	0,040***	0,050***	0,059***	0,062***	0,064***	0,060***	0,060***
Job change old employer, new job (no change ref.)	-0,044**	0,011	0,009	0,018***	0,024***	0,030***	0,031***	0,041***	0,046
Part-time x job change, new employer	-0,126***	-0,120***	-0,082***	-0,070***	-0,060***	-0,038*	-0,031***	-0,023*	-0,030
Part-time x job change new job, same employer	0,089	0,043	0,066**	0,036	0,021	0,002	-0,012***	-0,024	0,000

* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Additional control variables in the model were gender, education, region, temporary contract, age, marital status, nationality, health status, the age of the
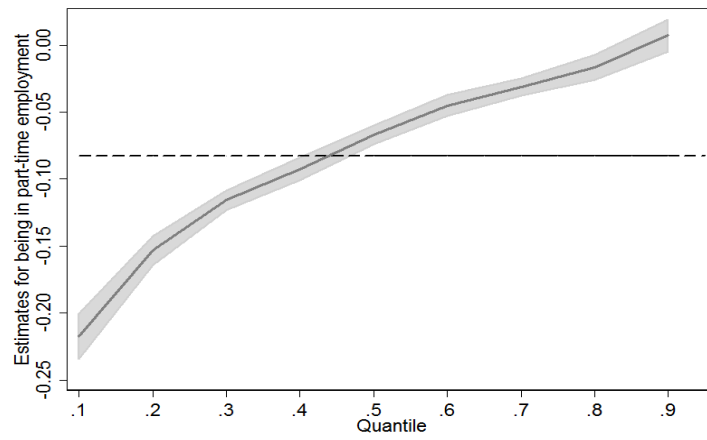
Source: Authors; GSOEP sample of 1991-2008.

Figure 1. Kernel density function estimates for the real gross hourly wage of part-time and full-time workers
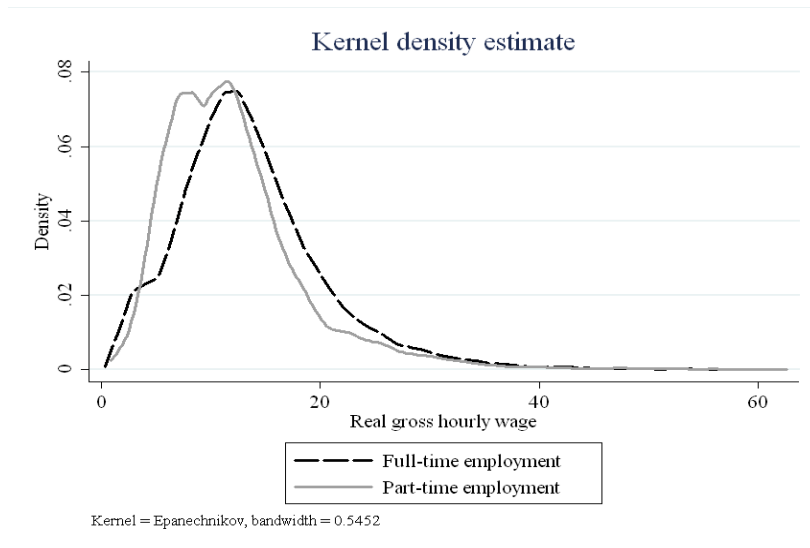
Source: Own calculation from GSOEP sample of 1991-2008.

Figure 2. Asymptotic 95% Confidence Interval of quantile regression estimates for part-time employment (controlled for other covariates)*

*The dashed line depicts the OLS estimate.

Source: own calculations from GSOEP sample of 1991-2008.