

# Employment Relationships at Risk

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**A "Two-Tier" Labour Market for Fixed-Term Jobs?**  
Evaluating Evidence from West Germany  
Using Quantile Regression

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## Abstract

Recent discussion of fixed-term contracts tends to ignore the considerable variation in the quality of these jobs and wages associated with them (e.g. Booth et al., 2002). In Germany fixed-term contracts are disproportionately found among workers with very high qualifications and those with low qualifications. The authors develop the concept of a "two-tier" labour market for fixed-term contracts and test this concept using quantile regression, comparing the wages and wage growth of fixed-term and permanent workers at different points on the wage distribution with data from the German Socio-Economic Panel. In the case of wages this concept is supported: those with high-wage fixed-term contracts earn only slightly less than permanent counterparts, those with low-wage temporary jobs earn much less. However, the wage growth findings do not point to polarisation: many of those with low-paying fixed-term contracts often experience high wage growth. Summarising, our results indicate that Ordinary Least Squares (OLS) regression misses important aspects of the wage structure of fixed-term workers, which is important to bear in mind when assessing the implications of these jobs for the individuals concerned.

## 1. Introduction

Fixed-term contracts in Europe have recently become the subject of both policy and research interest. Policy makers often see these contracts as an instrument of labour market flexibility, particularly relevant in countries with relatively high levels of employment protection as in Germany. Fixed-term workers can be laid off without incurring statutory redundancy payments or restrictions imposed by employment protection legislation. Critics argue that fixed-term contracts are very disadvantageous for the individual due to the insecurity inherent in these contracts combined with low wages and bad conditions of employment.

Recent research from Britain and a number of other European countries has examined the wages and conditions attached to fixed-term employment (Booth et al., 2002; Hagen, 2002; Jimeno and Toharia, 1993). In general, the finding is that fixed-term workers earn somewhat less than comparable permanent employees, though note that this wage differential falls when unobserved heterogeneity is accounted for (e.g., Booth et al., 2002; McGinnity and Mertens, 2002). However, these papers have tended to compare all fixed-term contracts with all permanent contracts, and this paper argues that it is important to consider the considerable heterogeneity of fixed-term contracts.

In Germany, with its highly developed vocational training system, fixed-term contracts are disproportionately found among those *without* vocational training, that is with university education or no qualifications. This is true of both labour market entrants (McGinnity and Mertens, forthcoming) and the labour force as a whole (Giesecke and Groß, 2003). Combining this observation with insights from diverse theoretical perspectives on fixed-term contracts, such as segmentation theory, labour adjustment, screening and on-the-job search models, we develop the concept of a "two-tier" labour market for fixed-term contracts. There is an "upper tier" of privileged fixed-term contracts. These are high-skilled jobs with good career prospects and high wages. There is also a "lower tier" with low-skilled fixed-term contracts with low wages. It is the task of this paper to investigate this hypothesis in more depth.

We begin by looking at wage levels and wage growth within different quartiles of the wage distribution. In order to test whether a clear distinction between "good" fixed-term jobs and "bad" fixed-term jobs can be found, we then use quantile regression techniques, which have been applied to a wide range of economic issues (see contributions in issue 26 / 2001 of *Empirical Economics*; Buchinsky, 1998). This in turn enables us to analyse whether the wage differentials between permanent and fixed-term workers previously found are a common

phenomenon for all workers on this type of contract, or limited to workers in different parts of the wage distribution. Wage growth has been less of a focus in the literature on temporary contracts to date, though a key question about the nature of temporary jobs is whether existing wage differentials can be compensated by rapid wage growth (e.g., Booth et al., 2002). For this paper an important question is whether workers with high-wage fixed-term contracts experience more rapid wage growth or those with low-wage fixed-term contracts "catch up".

Section 2 of this paper considers what theory can tell us about fixed-term jobs, and develops the concept of a two-tier labour market for fixed-term contracts. Section 3 presents the estimation methods and Section 4 introduces the data used. In order to assess empirical evidence on these issues, a micro data set is needed that includes all relevant information on wages, contract type, and personal and job characteristics. The German Socio-economic Panel (GSOEP) is an ideal data set for this purpose. Section 5 then presents the empirical analysis, beginning with some descriptive statistics before going on to model quantile regressions for wage levels and wage growth. Section 6 summarises our results and reflects on the theoretical and policy implications that consequently follow.

## 2. The Use of Fixed-Term Contracts and Theoretical Consequences for Wages

Dismissal regulations in Europe and high firing costs of permanent workers are generally believed to be the primary reason for the use of fixed-term contracts (e.g., OECD, 1993). In Germany, as in other European countries, both legal regulations and labour court decisions make it expensive and time-consuming to lay off permanent employees. For individual dismissals, dismissal protection regulations stipulate notice periods based on measures such as tenure, age and type of job; the employer needs a specific reason (i.e., misconduct) and the works council (*Betriebsrat*) needs to be present. If the employee challenges the dismissal, legal proceedings may be protracted, often resulting in either high severance payments or even rehiring of the employee. Since the Employment Promotion Act of 1985, employers can hire employees on a fixed-term contract without a reason for up to two years duration, thus avoiding potential redundancy payments and employment legislation restrictions (see Appendix A for details). The main intention in introducing this Act was to reduce unemployment by facilitating the use of fixed-term contracts.<sup>1</sup>

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<sup>1</sup> However, Blanchard and Landier (2002) argued that the introduction of fixed-term contracts may have perverse effects: The main effect could simply be a high turnover in fixed-term jobs, leading to higher and not lower unemployment.

Apart from the obviously higher job insecurity, fixed-term contracts may also be associated with different wage conditions. Different approaches to the use of fixed-term contracts generate rather different predictions about the wages associated with them. These predictions may be related to why employers use fixed-term contracts, why employees accept fixed-term contracts and how fixed-term contracts fit into the individual's employment history. In the following section we discuss a number of these competing hypotheses on the purpose of fixed-term contracts and then combine them to argue that there is a two-tier labour market for fixed-term contracts in Germany.

### 2.1 Fixed-Term Contracts: Wage Levels

One view implicit in neo-classical labour market theory is that fixed-term workers should receive higher wages to compensate for the job insecurity associated with fixed-term employment, otherwise an employee would simply not accept a fixed-term contract (Schömann et al., 1998). The employee accepts a wage that guarantees their income while without work, and compensates the loss of redundancy pay. If we assume *compensating wage differentials*, wages for temporary contracts will be higher than for similar permanent jobs.

While these compensating wage differentials will only be offered in competitive labour markets, a number of approaches view fixed-term employment as having substantially worse conditions of employment and poorer career prospects than permanent employment. Probably the most important approach is *labour market segmentation theory* (e.g. Doeringer and Piore, 1971). According to the basic tenets of this theory, the labour market is divided into primary and secondary segments. Primary segment jobs offer long-term, stable employment with structured career ladders. Jobs in the unskilled secondary segment – where fixed-term jobs will be found – offer lower wages, no training, few career prospects and unstable careers. Segments relying on unskilled labour will offer fixed-term contracts, in contrast to large engineering, professional and bureaucratic employers. These jobs will be unattractive to high-ability workers, and will be associated with lower wages than comparable permanent jobs.

Turning to the employer's perspective, the relative costs of hiring and firing, as well as expectations about long-run sales opportunities influence employer's decisions about hiring fixed-term versus permanent workers.<sup>2</sup> Fixed-term contracts might be then used by employers

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<sup>2</sup> Quite a large body of literature discusses the theoretical links between labour demand and adjustment costs (see e.g., Nickell, 1978, and for an overview Hamermesh and Pfann 1996).

to *regulate short-term fluctuations in demand*, if they are unsure about long-run sales opportunities and if it is expensive to fire permanent employees. Indeed Boockmann and Hagen (2001) showed that fixed-term contracts do serve as means of employment adjustment in Germany: positive changes in expected or actual turnover are associated with a higher probability of fixed-term contracts. If this is the case, we might expect fixed-term contracts to be offered in low-skill sectors and associated with lower wages than permanent workers.

A rather different reason sometimes proposed for the use of fixed-term contracts is the screening hypothesis. According to the screening approach, employers may use fixed-term contracts in order to extend the legally limited probation period. If the individual employee is good, they are retained in the firm and given a permanent contract. If not, the employer is spared expensive dismissal costs. Many, though not all, temporary jobs will lead to a permanent appointment in the same company. For temporary jobs that are used for screening and may be converted to permanent contracts at the end of the fixed-term contract, Guell (2000) provides an interesting application of the efficiency wage model to fixed-term contracts. Following this model, wages of fixed-term workers are lower than permanent workers because they play no incentive role in reducing shirking: employers reduce shirking in these fixed-term contracts by linking their conversion to permanent contracts to performance on the job. Thus, from the screening perspective, we would also expect lower wages for fixed-term employees, albeit for different reasons than those suggested by previous approaches.

Finally, in keeping with the idea that fixed-term contracts may actually have good job prospects is the suggestion that in some occupations fixed-term contracts could be part of a *career path*. For a number of professional careers, such as teachers, researchers and doctors, a series of temporary contracts is an important part of acquiring further experience before finally taking a permanent job. As jobs, where this is the case, are often highly skilled and associated with high ability, wages may not necessarily be much lower than permanent jobs.

## 2.2 Fixed-Term Contracts: Wage Growth

Regarding wage growth, many of the approaches mentioned above would predict lower wage growth for workers on fixed-term contracts. From the segmentation perspective, which sees fixed-term contracts as part of the secondary labour market, they will be associated with lower wage growth than for comparative permanent workers due to recurring unemployment spells, less training opportunities and worse job prospects. Equally, if fixed-term contracts are offered

to regulate short-term fluctuations in demand, they will most likely be associated with unstable careers and little or no wage growth.

The screening perspective, which posits that fixed-term contracts are an extended probation period, offers an alternative hypothesis on the wage growth associated with them. Wang and Weiss (1998) proposed that firms might offer low initial wages to fixed-term employees, but give high wage increases to those they want to retain. According to this perspective, individuals with a temporary contract who are offered a permanent appointment in the same company will experience rapid wage growth. Even if wages are found to be lower than for comparable workers on permanent contracts, we still might observe rapid wage growth, as fixed-term workers who receive a permanent contract "catch up" with permanent counterparts.

In contrast to the screening perspective, *on-the-job search* models, also highly relevant for the wage growth of fixed-term workers, propose that much wage growth is caused by changing employer. In the usual on-the-job search models (cf., Burdett 1978, Jovanovic 1979) quit rates tend to decline with the wage earned in the current job, that is the return to search declines with higher wages. This indicates that on-the-job search is very important, especially if individuals in a fixed-term job indeed earn less than comparable permanent workers. Analysing job mobility of men who have just entered the labour market Topel and Ward (1992) show that at least one third of early-career wage growth is accounted for by job change, at least in the United States. While both the screening perspective and on-the-job search predict higher wage growth among fixed-term workers, from the on-the-job search we would expect higher wage growth among fixed-term workers who *change* jobs, particularly if they earn less than comparable permanent workers. One potential limitation of this model is that it assumes that the decision to quit rests with the employee and that actually the fixed-term workers will often need to find a new job because their contract expires. In fact, the extent to which these job shifts are voluntary may depend on which kind of job it is, that is which sector, skill level and wage level. This is a point we return to below.

### *2.3 Two-Tier Labour Market for Fixed-Term Contracts*

Finally, combining a number of these perspectives, a third possibility is that while they always earn less, *how much less* temporary workers earn depends on the type of job, crucially for us, the wages the job pays. It could be that there are some temporary jobs that are "bad jobs" and in the "lower tier" – at the lower end of the wage distribution. Fixed-term contracts used to

regulate fluctuations in demand will tend to be associated with easy measurement of productivity and low firm-specific human capital. These are likely to be jobs with low or no qualification requirements and are likely to be of little importance to the functioning of the firm. These jobs will be found at the lower end of the wage distribution, and are associated with considerably lower wages than equivalent permanent jobs. Alternatively there are some temporary jobs that are "good jobs" and the "upper tier" - at the higher end of the wage distribution. For example, fixed-term contracts that are part of a career path will also tend to be found in professional jobs. These jobs will be situated at the higher end of the wage distribution and the workers will not have particularly low wages relative to permanent workers in similar jobs. In addition, the concept of compensating wage differentials may also be more relevant at the higher end of the wage distribution, where workers are highly skilled and have a high potential wage. They are more likely to have alternative permanent job offers, and thus will not accept fixed-term work unless there is a wage premium.

Similarly, some fixed-term contracts may be associated with lower wage growth than permanent contracts, others higher wage growth. Jobs for labour adjustment, often in the secondary segment, are associated with low-ability workers and lower wage growth than comparative permanent workers. In jobs used for screening purposes, in contrast, the wages may be initially low but are compensated for by higher future wages. These fixed-term workers will enjoy higher wage growth than their permanent counterparts (Wang and Weiss, 1998). Screening is more likely to apply to jobs where it is difficult to monitor productivity, hence the value of a relatively long period of probation. These jobs are likely, though not necessarily, to be associated with high qualifications and skills, for example managerial and professional jobs. In addition, one might expect that the voluntary quits implied by the on-the-job search model might be applicable for individuals who are already highly skilled and have high earnings. In summary, following the two-tier hypothesis, the wage differential between fixed-term and permanent workers, as well as differences between these groups in terms of wage growth, will depend on which part of the wage distribution the individual is found.

### **3. Estimation methods**

In the standard OLS (or mean) approach regression, coefficients are assumed to be constant across the whole conditional wage distribution. Our two-tier theory suggests, however, that this need not be the case. Indeed, fixed-term workers at different ends of the wage distribution may

not face the same risk of receiving lower wages than their permanent counterparts. Therefore, we estimate quantile regression models, as introduced by Koenker and Basset (1978), that fit quantiles to a linear function of covariates. Supplementing the usual estimation of conditional mean functions with conditional median and other conditional quantile functions allows us to look at the complete conditional wage (growth) distribution (see Buchinsky 1998; Fitzenberger et al 2001; Koenker and Hallock 2001). In fact, "potentially different solutions to distinct quantiles may be interpreted as differences in the response of the dependent variable to changes in the regressors at various points in the conditional distribution of the dependent variable" (cf. Buchinsky 1998, p. 89). In addition, one can test to what extent OLS estimates are driven by outliers as median regression, the most commonly known form of quantile regression, is much less affected by outliers than standard OLS regression.

The quantile regression model according to Koenker and Basset (1978) is defined as follows (cf., Buchinsky, 1998):

$$(1) \quad y_i = x_i' \beta_\theta + u_{\theta,i} \text{ and } \text{Quant}_\theta(y_i | x_i) = x_i' \beta_\theta$$

where  $(y_i, x_i)$ ,  $i = 1, \dots, n$  is a sample from some population where  $x_i$  is a  $K \times 1$  vector of regressors,  $\text{Quant}_\theta(y_i | x_i)$  denotes the conditional quantile of  $y_i$  conditional on  $x_i$ . Equation (1) implies that  $u_{\theta,i}$  satisfies the quantile restriction  $\text{Quant}_\theta(u_{\theta,i} | x_i) = 0$ . The estimator  $\hat{\beta}_\theta$  solves

$$(2) \quad \min_{\beta} \frac{1}{n} \left\{ \sum_{i: y_i > x_i' \beta} \theta |y_i - x_i' \beta| + \sum_{i: y_i < x_i' \beta} (1 - \theta) |y_i - x_i' \beta| \right\} = \min_{\beta} \frac{1}{n} \sum_{i=1}^n \rho_\theta(u_{\theta,i})$$

where  $\rho_\theta(u_{\theta,i})$  is the check function defined as

$$\rho_\theta(u_{\theta,i}) = \begin{cases} \theta u_{\theta,i} & \text{if } u_{\theta,i} \geq 0 \\ (\theta - 1) u_{\theta,i} & \text{if } u_{\theta,i} < 0 \end{cases}$$

Since the  $\theta$ th conditional quantile of  $y$  given  $x$  is defined by  $\text{Quant}_\theta(y_i | x_i) = x_i' \beta_\theta$ , its estimate is defined by  $\text{Quant}_\theta(y_i | x_i) = x_i' \hat{\beta}_\theta$ . Increasing  $\theta$  continuously from 0 to 1, it is possible to trace the entire conditional distribution of  $y$ , conditional on  $x$ . However, as samples are finite, only a limited number of quantiles is usually estimated. In our following empirical analysis, we therefore follow the literature in estimating the 90th, 75th, 50th, 25th and 10th percentage

quantiles.<sup>3</sup> These will give us a good overview of how the influence of contract type on wages evolves over the conditional distribution of  $y$ .

#### 4. Data

We use the data waves from 1995 to 2000 of the GSOEP for the analyses reported in this paper (SOEP Group, 2001). The GSOEP is a nationally representative panel survey that has collected data since 1984 and is an excellent data source for our purposes. While in the early years the information on the contract type is only selectively available, we have full information since 1995.<sup>4</sup> This allows us not only to study wage levels but also wage growth by comparing wages in two consecutive years.

In our analysis we focus on a sample of West German men. Wage determination in East and West Germany still differs (cf., Burda and Schmidt 1997, Franz and Steiner 2000), and labour market participation and wage determination also differs between men and women. In the interests of clarity, we do not report separate analyses for both parts of Germany or for men and women separately but only for West German men. In other work, we have investigated how the wages associated with fixed-term contracts differ between men and women and between East and West Germans (McGinnity and Mertens, 2002). In addition, the following selections were made. First, the self-employed and young workers in apprenticeship training schemes were excluded, as is conventional in German analyses of fixed-term employment. Although apprenticeships are fixed-term by definition, remuneration is very low and not comparable with regular work. Civil servants are also excluded, since their career patterns tend to be distinct from other workers and their wages are uniformly set without the possibility of individual wage renegotiation. The sample was limited to those of working age, that is between 18 and 60 years of age. In accordance with common practice, extreme hourly wage observations below 5 DM and above 100 DM were also excluded. Finally, for the models, we exclude observations with missing values on important variables: education, wages, type of contract, skill level, industry, firm size and region. A detailed list of independent variables used in the models, including their

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<sup>3</sup> We use STATA 7 for our estimations.

<sup>4</sup> We cannot identify agency workers at any point in this survey. Agency workers may or may not classify themselves as on a fixed-term contract. While agency work has risen steadily in Germany in the last decade, it was still only 1.2% of dependent employment in June 2000. Hence, we do not expect it to bias our results (Bundesanstalt für Arbeit, 2001).

means and frequencies, is provided in Table B1 (see Appendix B). With these selections applied to this data, we find 8.5% of male employees aged 18–60 in temporary contracts.<sup>5</sup>

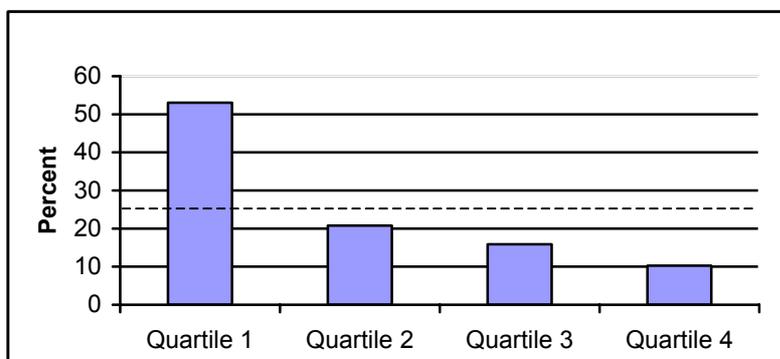
## 5. Empirical Analysis

### 5.1. Comparing the Wages of Fixed-Term and Permanent Workers

It has generally been found that fixed-term workers earn less, on average, than permanent workers. For Britain, Booth et al. (2002) report that male fixed-term workers' hourly wages were, at £7.38 per hour, approximately 16 % lower than workers with a permanent contract, who earned £8.55 on average over the period 1991–1997. In our data set, we find that West German males' hourly wage difference is even more pronounced with 32% lower wages for fixed-term workers.

In order to examine wage differentials between fixed-term and permanent employees in more detail, we split the sample into four different quartiles.

Figure 1: Percentages of Fixed-Term Workers Found in the Different Quartiles of the *Wage Level* Distribution



Note: Quartile 1 refers to the lowest quartile and quartile 4 to the highest quartile of the wage level distribution. The dotted line at 25% represents the proportion of fixed-term workers we would expect in each quartile.

Source: Own calculations based on pooled waves 1995–2000 of the GSOEP sample A.

Figure 1 shows that fixed-term workers are indeed more likely to be found in the lower quartiles of the wage distribution. Of all 428 male workers with fixed-term contracts, over 50% are to be found in the lowest quartile while only 10% are found in the highest quartile.<sup>6</sup> Further disaggregating our observations by three levels of education in Table 1, we find that fixed-term workers are, however, not only overrepresented in the lowest educational group with only

<sup>5</sup> 7.9% of women are found in fixed-term contracts. Women are not substantially overrepresented in temporary contracts, as in some other countries like Britain (OECD, 1993).

<sup>6</sup> This refers to our pooled sample of 7593 male workers between 1995 and 2000. Selections were described above in the data

secondary education, but also in the group of university graduates. By contrast, workers with vocational training, clearly the largest group of workers in Germany, are less likely to be found in fixed-term contracts. This confirms previous findings for Germany (Schömann and Kruppe, 1994; Giesecke and Groß, 2003). While the university graduates are overrepresented in fixed-term contracts in all quartiles, those with only secondary education are primarily overrepresented in the lowest quartile – basically because there are not many workers with lower qualifications in the highest wage quartile.

Table 1: Educational Distribution of Male Employees by *Wage Level*/Quartiles (%)

	Secondary education	Vocational training	Tertiary degree
Overall			
Permanent contract	9.41	73.87	16.72
Fixed-term contract	16.36	52.57	31.07
Quartile 1 (lowest)			
Permanent contract	19.21	78.34	2.45
Fixed-term contract	25.11	52.86	22.03
Quartile 2			
Permanent contract	10.26	85.26	4.47
Fixed-term contract	7.87	65.17	26.97
Quartile 3			
Permanent contract	6.40	80.36	13.24
Fixed-term contract	7.35	48.53	44.12
Quartile 4 (highest)			
Permanent contract	2.70	52.32	44.98
Fixed-term contract	2.27	31.82	65.91

Note: Quartile 1 is the lowest and quartile 4 is the highest quartile in the wage distribution.

Source: Own calculations based on pooled waves 1995–2000 of the German Socio-Economic Panel (GSOEP) sample A.

These descriptive findings lend support to our two-tier labour market hypothesis, that is that not all fixed-term jobs can be rated equally good or bad. Particularly workers with low qualifications who are already in the lowest quartile of the wage distribution suffer further disadvantage when contracted on a fixed-term basis, due to the high probability of experiencing some unemployment. On the other hand over 25% of all fixed-term jobs are found in the upper half of the wage distribution, which is, by itself, a positive sign.<sup>7</sup>

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#### Section 4.

<sup>7</sup> Looking at the industrial distribution we find that fixed-term workers are overrepresented in the service sector, that is, other services (35.5% of all fixed-term workers versus 21.1% of permanent workers), non-profit organisations (4.5 of all fixed-term workers vs. 2.7% of permanent workers) and the state sector (11.2% of all fixed-term workers vs. 7.7% of permanent workers). Looking more carefully at the quartiles, one finds that 53% of all fixed-term workers in the highest wage quartile are found in other services, compared to only 18% of permanent workers. In the lowest wage quartile, fixed-term workers are also disproportionately found in other services (33% of fixed-term workers in the lowest wage quartile vs. 24% of permanent workers in this quartile) but also in the state sector (13% of fixed-term workers in the lowest wage quartile vs. 4% of permanent workers).

What is most relevant now for our two-tier labour market hypothesis is the question of whether wage differentials behave equally over the whole distribution. Table 2 compares the mean log wages for fixed-term and permanent workers in the overall sample, but is also disaggregated for the different quartiles of the wage distribution. It becomes immediately clear that negative wage differentials are by no means a general phenomenon. In the highest quartile, fixed-term workers tend to earn even more on average – at least before controlling for any individual or job characteristics.

Table 2: Mean Log Wages of Male Employees by Quartiles

	Mean log wages	Mean log wages (compensated <sup>1</sup> )
Overall		
Permanent	3.317	0.014
Fixed-term	3.035	-0.234
Quartile 1 (lowest)		
Permanent	2.869	-0.371
Fixed-term	2.717	-0.518
Quartile 2		
Permanent	3.181	-0.082
Fixed-term	3.177	-0.084
Quartile 3		
Permanent	3.400	0.092
Fixed-term	3.396	0.111
Quartile 4 (highest)		
Permanent	3.770	0.376
Fixed-term	3.825	0.447

Note: Quartile 1 is the lowest and quartile 4 is the highest quartile in the wage distribution.

<sup>1</sup> Compensated results are equal to the mean of the residuals from an Ordinary Least Squares (OLS) wage regression where the log of the wage is regressed on a constant, age and educational dummies for the overall sample.

However, some of these results may simply reflect the fact that workers have different education and training qualifications and labour market experience and thus different wages. Therefore a wage quantile becomes equivalent to an education quantile. We, therefore, also present compensated results in Table 2, where wage differentials are "corrected" for standard human capital variables. This is accomplished by first estimating a simple Mincer type wage regression, where the log of the hourly wage is regressed on a constant, age as a proxy for experience and educational dummies reflecting vocational training and university degree – the reference group has only secondary education. Using the residuals from that regression we now estimate mean "residual" wages for fixed-term and permanent workers. The picture is comparable to the uncompensated results: in the lowest quartile we find a larger negative residual wage differential for fixed-term workers and in the higher quartiles an equal or even larger positive residual wage differential for the workers in fixed-term contracts.

## 5.2. A Multivariate Analysis of Wage Levels Using Quantile Regression

As a prelude to the quantile regression, we estimate an OLS regression of wages. Controlling for individual and job characteristics, the estimated difference between the hourly wages of fixed-term and permanent workers falls to 15% for West German men. The covariates included in this model are age, education, part-time worker status, spouse present, skill level, firm size, industry, region and the year of observation.<sup>8</sup> In general, these findings are similar to earlier OLS estimates for Germany (Schömann and Kruppe, 1993, 1994; Schömann and Hilbert, 1998) and more recent estimates by McGinnity and Mertens (2002) and Hagen (2002).<sup>9</sup> Booth et al. (2002) report negative wage differentials for Britain. Jimeno and Toharia (1993) also estimated wage regressions to show that fixed-term workers earn approximately 10% less, controlling for observable individual and job characteristics.

Turning now to the quantile regressions, we are able to find out whether the wage pattern observed in the purely descriptive analysis holds in the multivariate context of Mincer type wage regressions. We estimate the following model:

$$(3) \quad \ln w_{i,t} = \alpha + \gamma_{\theta} \text{fixed}_{i,t} + \beta_{\theta} x_{i,t} + u_{\theta,i,t}$$

where the estimate of the  $\theta$ th conditional quantile of  $\ln w$  given *fixed* and  $x$  is defined by  $\text{Quant}_{\theta}(\ln w_{i,t} \mid \text{fixed}_{i,t}; x_{i,t}) = x_{i,t}' \hat{\beta}_{\theta}$ . The control variables used in  $x$  can be found together with means and frequencies in Appendix Table B1. Apart from relatively standard controls for personal and job characteristics, we additionally include unemployment experience during the past 5 years, generated from the so-called employment calendar of the GSOEP, which includes information on labour force status on a monthly basis. As previous research has shown, this variable controls for at least part of the individual heterogeneity and tends to reduce the estimates on the fixed-term dummy variable *fixed* (McGinnity and Mertens, 2002).<sup>10</sup>

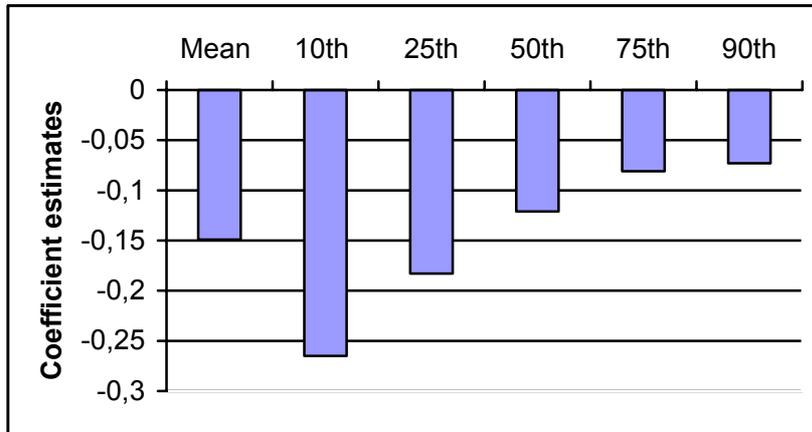
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<sup>8</sup> Full results can be obtained from the authors on request.

<sup>9</sup> Hagen (2002) then proceeded to estimate models which control for selection on observables, that reduced the wage differentials. Controlling for selection on unobservable results in much larger wage differentials, though these latter estimates are somewhat implausible.

<sup>10</sup> Unfortunately, quantile regression does not lend itself to the inclusion of individual fixed effects like conventional panel models. Within an OLS framework, individual fixed effects significantly reduce the estimated differentials by contract type. We assume, however, that the pattern of results across quantiles will not be influenced by individual heterogeneity.

Figure 2: Wage Differences Between Fixed-Term and Permanent Workers: Comparing OLS Results (Mean) and Quantiles



*Note:* Coefficients on the fixed-term contract dummy in OLS (mean) and quantile wage regressions. Compensated results are calculated by first regressing log wages on conventional human capital variables (age, educational dummies) and then running the quantile regressions with the residuals from that regression as a dependent variable.

*Source:* Own calculations based on pooled waves 1995–2000 of the GSOEP sample A.

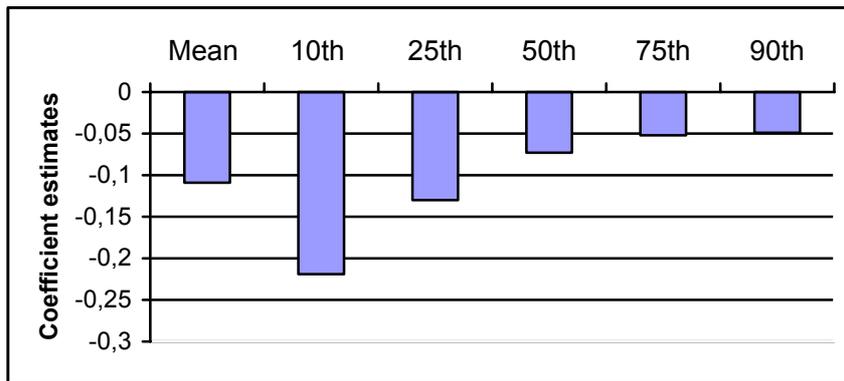
In Figure 2 we compare the quantile estimates to these standard OLS (or mean) differentials. In contrast to the descriptive analysis of different quartiles, in the quantile estimates we always observe negative differentials.<sup>11</sup> However, these differentials clearly decrease with higher quantiles. Workers in the upper quantiles (90th and 75th) earn only slightly less than their permanent counterparts, whereas workers in the lowest (10th) quantile earn considerably less. We find no evidence of compensating wage differentials in any of these quantiles, but our findings provide some support for the concept of a two-tier labour market for fixed-term contracts, where how much less fixed-term employees earn depends on their position on the wage distribution.<sup>12</sup>

Who are the fixed-term workers in this top wage quantile? In a detailed study of third-level graduates, Minks and Schaeper (2002) examined the graduates' jobs five years after graduation. They found that graduates working in the public sector with fixed-term contracts tend to earn more than their permanent counterparts, while those working in the private sector tend to earn less. They suggest that certain significant occupational groups, for example, doctors and academics who have high earnings and often a series of fixed-term contracts account for these findings. In these high-skilled occupations, fixed-term contracts are a part of career progression at the beginning of working life.

<sup>11</sup> Most of these differentials are significant as can be seen in specification I in Table B2 (Appendix B).

<sup>12</sup> As can be seen, the mean and median differ, with the mean falling between the 25th and 50th-percentage quantile for men.

Figure 3: Wage Differences between Fixed-term and Permanent Workers with Tenure of Less than Two Years: Comparing OLS Results (Mean) and Quantiles



*Note:* Coefficients on the dummy for fixed-term contract workers with tenure of less than 2 years in OLS (mean) and quantile wage regressions. Control group: workers with permanent contract and tenure of less than 2 years. Compensated results are calculated by first regressing log wages on conventional human capital variables (age, educational dummies) and then running the quantile regressions with the residuals from that regression as a dependent variable.

*Source:* Own calculations based on pooled waves 1995–2000 of the GSOEP sample A.

These estimated differentials for contract type do not control for tenure. As most fixed-term contracts generally do not last longer than two years, due to the legal restrictions discussed in Section 2, such a control is important. It could be that fixed-term workers earn less than workers with long tenure, but not necessarily less than permanent contract workers with tenure of up to two years. In a second specification, we compare those workers with fixed-term contracts and a tenure of less than two years with permanent workers with a tenure of less than two years. Results can be found in Figure 3 (and again in Table B2, Appendix B). The pattern remains fairly constant, although it appears less extreme.

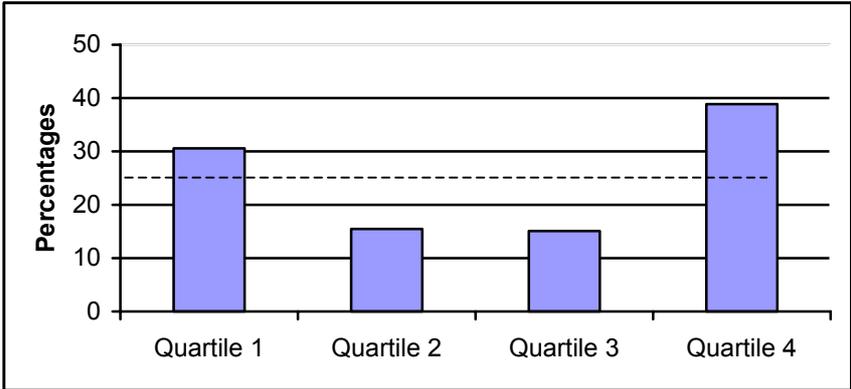
### 5.3. Moving On? Wage Growth and Firm Shifts

Having shown that there is a clear distinction between fixed-term workers' wage levels in the different quantiles, we now investigate whether wage growth differs for fixed-term and permanent workers. From the literature, we have derived a number of different hypotheses concerning wage growth (see Section 2.2). In contrast to the initial hypothesis of lower wage growth from the segmentation and labour adjustment perspectives, Wang and Weiss (1998) proposed that workers hired under fixed-term contracts for screening purposes will experience large wage growth once offered a permanent contract with the same employer. From on-the-job search models came the alternative hypothesis that workers who switch to a new firm might also register high wage growth. Finally, we propose the two-tier hypothesis that some fixed-term workers experience higher wage growth, and some lower wage growth than permanent

counterparts, and which of the two types may depend on which part of the wage distribution the individual is situated. In this section, we explore wage growth and firm switches in more depth.

Looking first at Figure 4, we find that the highest percentages of fixed-term workers are found in the highest quartile (4) and the lowest quartile (1) of the wage growth distribution. Looking at the mean wage growth, we find that fixed-term workers on average have higher wage growth, but the representation by quantiles differs dramatically. In the lowest quartile wage growth of fixed-term workers is *lower* and in the highest quartile wage growth is considerably *higher*. In the other two quartiles, wage growth is basically identical. This shows that positive wage growth differentials are by no means a phenomenon common to all workers on fixed-term contracts. In fact, only a limited number of fixed-term workers have very high wage growth - those who are clustered in the highest wage growth quartile.

Figure 4: Percentages of Fixed-Term Workers Found in the Different Quartiles of the *Wage Growth* Distribution



*Note:* Quartile 1 refers to the lowest quartile and quartile 4 to the highest quartile of the wage growth distribution. Quartiles were estimated separately for men and women. The dotted line at 25% represents the proportion of fixed-term workers we would expect in each quartile.

*Source:* Own calculations based on pooled waves 1995–2000 of the GSOEP sample A.

Table 3: Mean Wage Growth of Male Employees by Quartiles

	Mean wage growth	Mean wage growth (compensated <sup>1</sup> )
Overall		
Permanent	0.036	-0.002
Fixed-term	0.080	0.031
Quartile 1 (lowest)		
Permanent	-0.167	-0.205
Fixed-term	-0.222	-0.265
Quartile 2		
Permanent	-0.002	-0.039
Fixed-term	-0.003	-0.049
Quartile 3		
Permanent	0.067	0.029
Fixed-term	0.068	0.029
Quartile 4 (highest)		
Permanent	0.249	0.211
Fixed-term	0.355	0.324

Note: Quartile 1 is the lowest and quartile 4 is the highest quartile in the wage distribution.

<sup>1</sup> Compensated results are equal to the mean of the residuals from an OLS wage regression where the log of the wage is regressed on a constant, age and educational dummies for the overall sample.

Source: Own calculations based on pooled waves 1995–2000 of the GSOEP sample A.

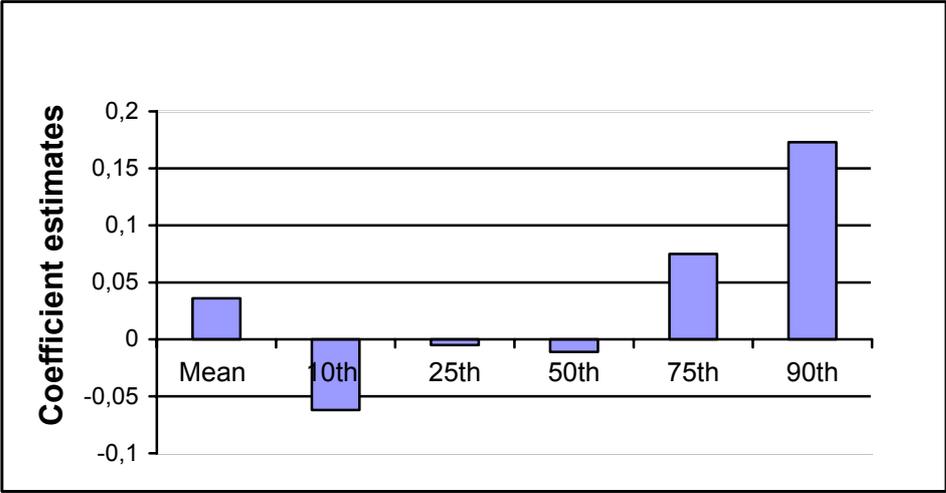
Just as for wage levels we now proceed to model wage growth using OLS and quantile regression techniques. The model now becomes:

$$(4) \quad \ln w_{i,t+1} - \ln w_{i,t} = \alpha + \gamma_{\theta} \text{fixed}_{i,t} + \beta_{\theta} x_{i,t} + u_{\theta i,t}.$$

Similar wage growth regressions have frequently been used to study, for example, the effects of job mobility and reasons for job change on wages (Addison and Portugal, 1989; Ruhm, 1987; Neal, 1995; Burda and Mertens, 2001). The results depicted in Figure 5 account for tenure and emphatically reinforce the descriptive outcomes. In the 90th and 75th percentage quantile we observe large positive wage growth differentials in favour of fixed-term workers. This group of fixed-term workers enjoy very rapid wage growth, consistent with expectations from screening or on-the-job training. In the lowest quartile workers have significantly lower wage growth – so again in the wage level analysis we find that for workers who already have low wage growth, having a fixed-term contract disadvantages them even further.<sup>13</sup> This finding is more in keeping with the predictions of segmentation theory or fixed-term contracts as a means of labour adjustment.

<sup>13</sup> Results and significances can be found in the Table B3 (Appendix B).

Figure 5: Wage *Growth* Differences Between Fixed-Term and Permanent Workers with Tenure of Less Than Two Years: Comparing OLS Results (Mean) and Quantiles



*Note:* Coefficients on the dummy for fixed-term contract workers with tenure of less than 2 years in OLS (mean) and quantile wage growth regressions. Control group: workers with permanent contract and tenure of less than 2 years. Compensated results are calculated by first regressing log wages on conventional human capital variables (age, educational dummies) and then running the quantile regressions with the residuals from that regression as a dependent variable.

*Source:* Own calculations based on pooled waves 1995–2000 of the GSOEP sample A.

But is it individuals with initially high wages who experience high wage growth? In Table 4 we present the joint wage growth and wage level distribution. Looking at the last column, we find that high percentages of workers with relatively low wages (51.8%) experience above average wage growth. On the other hand, only 15.63% of workers with very high wages experience such above average wage growth. For permanent workers, the figures are 36.8% and 15.6% respectively. The basic pattern is, in itself, not surprising and can be related to what is sometimes called "regression to the mean". There may also be "ceiling" and "floor" effects here, that is, workers with low wages already earn on or around the minimum wage, therefore their wages will not fall further. Workers already in the highest wage quintile may experience a "ceiling" effect, their high wages hitting a "ceiling" and not growing rapidly.<sup>14</sup>

It is interesting, however, that fixed-term workers with low wages are more likely to experience high wage growth. Not all workers in low wage jobs are, therefore, trapped in a series of equally badly-paid jobs. Consistent with the screening perspective and on-the-job search models, a group of fixed-term workers with low wages initially experience high wage growth. While a rather strict application of the two-tier hypothesis might have led us to expect that the highly-skilled upper tier has both higher wages and higher wage growth, this is clearly not the case.

<sup>14</sup> For example, if we look more closely at occupational positions we find no private sector managers in the highest wage growth

There may be upper and lower tiers in both wages and wage growth - but by in large these are not the same individuals.

Table 4: Wage Levels and Wage Growth for Permanent and Fixed-Term Male Employees

	Wage growth			
Wage levels	Quartile 1	Quartile 2	Quartile 3	Quartile 4
<b>Permanent</b>				
Quartile 1	19.09%	19.34%	24.76%	36.81%
<i>No. of observations</i>	236	239	306	455
Quartile 2	22.59%	25.70%	26.09%	25.62%
<i>No. of observations</i>	291	331	336	330
Quartile 3	28.60%	26.71%	24.96%	19.73%
<i>No. of observations</i>	377	352	329	260
Quartile 4	28.57%	29.63%	26.00%	15.80%
<i>No. of observations</i>	378	392	344	209
<b>Fixed-term</b>				
Quartile 1	20.14%	17.99%	10.07%	51.80%
<i>No. of observations</i>	28	25	14	72
Quartile 2	50.00%	1.92%	21.15%	26.92%
<i>No. of observations</i>	26	1	11	14
Quartile 3	28.57%	23.81%	19.05%	28.57%
<i>No. of observations</i>	12	10	8	12
Quartile 4	46.88%	15.63%	21.88%	15.63%
<i>No. of observations</i>	15	5	7	5

Note: The table reads as follows: e.g. 20.14% of all fixed-term observations in the lowest level quartile have wage growth in the lowest wage growth quartile.

Source: Own calculations based on pooled waves 1995–2000 of the GSOEP sample A.

Finally, Table 5 looks at whether high wage growth is related to job switchers or job stayers. Interestingly, job switches are most common in the highest wage growth quartile. Though while high percentages of fixed-term workers accomplish high wage growth in the highest quartile through firm switches (27%), many workers receive high wage growth within their firm. This shows that both on-the-job search and intra-firm wage growth as proposed by Wang and Weiss (1998) are important means for fixed-term workers to "catch up". High wage growth is not only linked to screening and the offer of a permanent contract in the same firm.

Table 5: Wage Growth and Firm Switches in Percentages

	Firm switch	
	No	Yes
Overall		
Permanent	94.73	5.27
Fixed	79.25	20.75
Quartile 1 (lowest)		
Permanent	93.14	6.86
Fixed	82.72	17.28
Quartile 2		
Permanent	97.64	2.36
Fixed	90.24	9.76
Quartile 3		
Permanent	96.35	3.65
Fixed	77.50	22.50
Quartile 4 (highest)		
Permanent	91.63	8.37
Fixed	72.82	27.18

Source: Own calculations based on pooled waves 1995–2000 of the GSOEP sample A.

One plausible interpretation of Table 5 is that employees' firm switches in the top quartile are a voluntary part of a strategy by the employee to achieve higher wage growth, whereas employees in the bottom quartile were compelled to switch firms since their contract expired and they were not re-hired by the same employer, either because there were no other jobs available in the firm, or the employer decided against hiring them permanently after their "screening". Testing this interpretation is beyond the scope of this paper.

## 6. Conclusions

The main message of this paper is that the impact of fixed-term contracts on wages depends very much on where these jobs are found in wage distribution. Workers with relatively high-paying fixed-term contracts earn only slightly less than their permanent counterparts, workers with low-paying temporary jobs earn much less than those with a comparable permanent job (Figure 2). These findings support the concept of a two-tier labour market for fixed-term contracts. There is a "higher tier" of jobs where fixed-term contracts are not such a disadvantage compared to permanent jobs and a "lower tier" where having a fixed-term contract puts the individual at considerable disadvantage, at least in terms of wages.

Equally, while on average fixed-term workers who are still employed the following year in general experience slightly higher wage growth than permanent workers, this "average" estimate masks very important differences among fixed-term workers. Workers with relatively high wage growth experience considerably higher wage growth than their permanent counterparts. However, fixed-term workers who experience wage loss (in the lowest wage growth quantile) experience greater wage losses than their permanent counterparts (Figure 5). Summarising the situation of fixed-term workers: when wage growth is high it is much higher, but when it is negative it is even more negative than for permanent workers. A final interesting finding on wage growth is that generally it is not the same fixed-term workers who have high wages and then high wage growth. Many of those with lower wages initially "catch up" through rapid short-term wage growth. This qualifies our concept of a two-tier labour market - it is not the case that the high earners in the "upper tier" experience high wage growth.

Regarding the policy implications of these findings, it would be wrong for policymakers to assume that fixed-term employees always earn less than comparable permanent employees, and that they have lower wage growth. However, workers who earn much less are those whose earnings are already low, being about half of all male fixed-term workers (Figure 1). This group are doubly disadvantaged: they have a short-term employment contract and very low wages. For them a fixed-term contract is certainly not a better alternative than a comparable permanent job. However, this "double disadvantage" is somewhat counteracted by the wage growth findings. At least many fixed-term employees with low initial earnings experience relatively high wage growth. Some individuals may have low initial earnings and low wage growth, but we did not identify a general trend in this direction. That said, we only observed wage growth for those in employment, and those with initially low wages may have become unemployed. Examining this remains a task for future research.

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## Appendices

### Appendix A

#### The Employment Promotion Act (1985): Introduction, Extensions and Amendments.

- Pre-1985 - fixed-term contracts only permitted for special reasons. Fixed-term contracts were limited to 6 months, and the employer had to demonstrate that the work was temporary by nature.
- The "Employment Promotion Act" (*Beschäftigungsförderungsgesetz*) of 1985, removes the need for a reason under certain conditions. New employment contracts or employment contracts immediately following vocational training are now permitted for a duration of up to 18 months. In small, new firms the contract can be for 24 months. Valid until December 1989.
- 1990, 1994 Extensions of the Employment Promotion Act, finally until December 2000.
- 1996 - Extension of the maximum duration of fixed-term contract to 24 months for new contracts; 3 continuous extensions within the maximum period allowed; unlimited temporary contracts for employees over 60.
- 2001 - The new law on part-time employment and fixed-term contracts, extends the previous legislation on fixed-term contracts for an unlimited period.

Source: Schömann and Hillbert (1998), Rudolph (2000), Viethen (2001).

### Appendix B

Table B1: Means and Frequencies in the Wage Level Analysis

West German men	N of cases	Means/frequencies
In (hourly wage)	7281	3.31
Fixed-term	367	5.04
Part-time	227	3.12
Age < 30	1287	17.68
Age 30–44	3772	51.81
Age ge 45	2222	30.52
Spouse	5568	76.47
No training	689	9.46
Vocational training	5301	72.81
University	1291	17.73
Unskilled blue-collar	917	12.59
Skilled blue-collar	2257	31.00
Unskilled white-collar	127	1.74
Skilled white-collar	2016	27.69
Highly skilled white-collar	1937	26.60
Small firm (< 20)	1324	18.18
Medium (20–199)	1993	27.37
Large firm (>=200)	3964	54.44

Source: Own calculations based on pooled waves 1995–2000 of the GSOEP sample A. Selection: without civil servants, without self-employment, without apprentices, only employees who are 18–60 years old. Hourly wage observations below 5 DM and above 100 DM were dropped.

Table B2: Quantile *Wage Level* Regressions

	Mean (OLS)	Quantiles				
		90th	75th	50th	25th	10th
<b>Specification I</b>						
Fixed-term dummy	-0.149*** (0.014)	-0.073*** (0.025)	-0.081*** (0.917)	-0.121*** (0.017)	-0.183*** (0.020)	-0.265*** (0.019)
<b>Specification II</b>						
Fixed < 2	-0.109*** (0.019)	-0.049 (0.035)	-0.052** (0.022)	-0.073*** (0.018)	-0.130*** (0.023)	-0.219*** (0.028)
Fixed ≥ 2	-0.086*** (0.023)	-0.022 (0.042)	-0.051* (0.028)	-0.040* (0.023)	-0.112*** (0.028)	-0.146*** (0.035)
2 ≤ Perm < 5	0.035*** (0.011)	0.044** (0.020)	0.026** (0.013)	0.041*** (0.011)	0.037*** (0.013)	0.034** (0.017)
5 ≤ Perm < 10	0.069*** (0.011)	0.059*** (0.020)	0.041*** (0.013)	0.071*** (0.010)	0.081*** (0.013)	0.081*** (0.016)
Perm ≥ 10	0.106*** (0.010)	0.043** (0.020)	0.071*** (0.013)	0.123*** (0.010)	0.145*** (0.013)	0.120*** (0.016)

Note: Significance levels: \*\*\* = 1%, \*\* = 5%, \* = 10%.

Source: Own calculations based on pooled waves 1995–2000 of the GSOEP sample A. Selection: without civil servants, without self-employment, without ABM (Employment Creation Schemes), without apprentices, only employees who are 18–60 years old. Hourly wage observations below 5 DM and above 100 DM were dropped. Further controls: age dummies, education dummies, part-time worker status, spouse present, skill level, firm size, industry, region, the year of observation and the proportion of time unemployed during the past five years.

Table B3: Quantile *Wage Growth* Regressions

	Mean (OLS)	Quantiles				
		90th	75th	50th	25th	10th
<b>Specification I</b>						
Fixed-term dummy	0.036** (0.014)	0.153*** (0.024)	0.058*** (0.014)	0.003 (0.010)	-0.0001 (0.012)	-0.058*** (0.020)
<b>Specification II</b>						
Fixed < 2	0.036* (0.019)	0.173*** (0.035)	0.075*** (0.021)	-0.011 (0.010)	-0.005 (0.014)	-0.062* (0.029)
Fixed ≥ 2	0.032 (0.023)	0.106*** (0.037)	0.022 (0.024)	0.003 (0.012)	-0.002 (0.016)	-0.014 (0.034)
2 ≤ Perm < 5	-0.001 (0.010)	-0.032* (0.019)	-0.021* (0.011)	-0.018*** (0.005)	-0.014* (0.008)	0.000 (0.016)
5 ≤ Perm < 10	-0.004 (0.010)	-0.025 (0.018)	-0.027** (0.011)	-0.011** (0.005)	0.001 (0.007)	0.007 (0.016)
Perm ≥ 10	-0.003 (0.010)	-0.036** (0.017)	-0.026** (0.010)	-0.017*** (0.005)	0.000 (0.007)	0.000 (0.015)

Note: Significance levels: \*\*\* = 1%, \*\* = 5%, \* = 10%.

Source: Own calculations based on pooled waves 1995–2000 of the GSOEP sample A. Selection: without civil servants, without self-employment, without ABM (Employment Creation Schemes), without apprentices, only employees who are 18–60 years old. Hourly wage observations below 5 DM and above 100 DM were dropped. Further controls: age dummies, education dummies, part-time worker status, spouse present, skill level, firm size, industry, region, the year of observation and the proportion of time unemployed during the past five years.