



Working Paper

Labour Market Flexibility and Inequality
The Changing Risk Patterns of Temporary
Employment in Germany

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Editorial Note:

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Abstract

While previous research on temporary employment has shown that certain labour market groups are more likely than others to enter this kind of inferior employment, there has been only little research on the question to what extent these allocation patterns have changed over time. Against the background of pervasive structural and institutional changes that affected the German labour market since the beginning of the 1990s there are reasons to believe that allocation patterns have changed as well. However, on a theoretical level there are different views regarding the quality of these changes. Whereas some scholars argue that social inequality is enhanced along the existing lines of social division, others maintain that risks are less and less socially structured. To evaluate this question empirically we use data from the German Mikrozensus for the period from 1989 to 2005. The analysis reveals that, first, on the aggregate level the overall share of temporary employment has only slightly increased during that time period. Second, as indicated by the results, particularly those individuals belonging to groups that already have had a weak labour market position were increasingly allocated to temporary jobs. Third, contrary to the thesis of a de-structuration of social inequality, the findings reveal no decline in the overall importance of “classical” determinants of temporary employment relationships.

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1 Introduction

During the last two decades the German labour market has undergone a deep crisis and severe transformation. This profound restructuring process was *inter alia* accompanied by an increase of the share of so called flexible or non-standard employment as one form of labour market flexibilisation (Esping-Andersen and Regini 2000). By using forms of flexible employment German firms tried to counter a growing macroeconomic uncertainty as well as an increased international competition. However, the category “flexible employment relationships” encompasses very different types of flexible work arrangements that are assumed to lead to very different socio-economic consequences for the workers employed in these employment relations. One simple but still useful classification distinguishes between employment forms of internal and of external flexibility (Atkinson 1985). Whereas the former means adjusting working times, training and firm-internal workplace reorganisation, the latter refers to the usage of temporary contract, outsourcing and subcontracting. In this paper we focus on a very prominent form of external flexibility, namely temporary employment. Temporary jobs are characterised by contracts of limited duration that ends automatically after their expiry. Through temporary jobs employers are given the chance to lower their labour input adjustment costs as these contracts reduce the firing costs (Bentolila and Bertola 1990; Cahuc and Postel-Vinay 2002).

Temporary work has induced fierce discussions in the scientific literature and in the public debate. Proponents of labour market flexibilisation argue that by reducing firing costs temporary contracts enhance the employment chances of labour market outsiders and can thus provide a “bridge” to the labour market. A contrasting perspective is that temporary work is associated with lower wages, poor working conditions, higher unemployment risks, and small chances for further promotion. In the latter view temporary jobs are seen as being “traps” that create or at least help to stabilise a segmentation of the labour market. Many recent studies have found empirical evidence for this “segmentation” perspective (Amuedo-Dorantes 2000; Booth, Francesconi and Frank 2002; Giesecke and Groß 2003; Kalleberg 2000). Importantly, the reported negative effects of temporary jobs can be regarded as being structural as they are solely due to the idiosyncratic positional characteristic of temporary jobs (i.e. reduced employment protection) and not to individual differences of the job holders (e.g. with respect to educational levels). Given such structural disadvantages of temporary employment the question is relevant who enters such employment relations. Hence, it is important to understand the allocation processes of individuals to these inferior labour market positions. Moreover, against the background of a far-reaching structural change it becomes even more important to investigate the shifts in the allocation patterns and their consequences for the structure of social inequality.

However, while there are some studies on the determinants of temporary jobs in the German labour market (Buchholz and Kurz 2005; Giesecke 2006; Giesecke and Groß 2003; Groß 1999; Schömann, Rogowski and Kruppe 1998), there is only very limited evidence on how these determinants have changed over time. For example, Schömann et al. (1998) compare the incidence of temporary contracts disaggregated by gender, age and educational level in the 1980s and early 1990s. They find that gender-specific rates converge over time such that the disadvantage for women with respect to

the risk of holding a temporary contract diminishes over time. The analysis for age and educational groups, respectively, is limited to two or four time points such that no real trend can be detected. Furthermore, their trend analysis is only based on simple bivariate models and thus neglects other potential confounding influences. Thus, so far there is no study that uses multivariate analyses to systematically investigate whether these allocation patterns have changed over time. However, given the substantial structural changes in the German labour market during the last two decades the latter question becomes relevant. As it is outlined in the theoretical section of this paper, there are reasons to believe that structural changes like globalisation, educational expansion or rising levels of unemployment as well as institutional changes like modifications of labour law legislation or the weakening of unions' power might have had an impact on the process of allocating people to temporary jobs.

Therefore, this paper aims at giving some new insights about potential changes in the allocation patterns of temporary employment. Specifically, the paper contributes to the existing literature in three ways. First, we will answer the question whether or not the risk of holding a temporary contract changed for certain socioeconomic groups in Germany during the period from 1989 to 2005, which is an improvement compared to earlier studies that are restricted to short time periods or only to one time point. Using data from the German Mikrozensus, we are able to draw inferences from a large national sample and, furthermore, we can control for a rich set of individual and structural variables. Second, we evaluate if the nexus of "classical" determinants, e.g. age, education, and occupational class, and temporary employment has in general remained unchanged or if these determinants have become either more or less important for the allocation process. However, if the predictive power of "classical" dimensions of social inequality changes residual variation is likely to change as well. Thus, in order to account for changing residual variation we, third, compare results from standard logistic regressions with heterogeneous choice models. From a statistical point of view, heteroscedasticity induced by changing residual variation over time biases the results from standard logistic regressions. Heterogeneous choice models try to account for heteroscedasticity by modelling explicitly the residual variation, thereby allowing for an unbiased estimation of parameters in case of non-constant variance in the unobserved part of the model.

This paper is organised as follows. In section 2 we discuss structural and institutional changes that may have influenced the risk patterns in the process of allocating people to temporary employment over time. Section 3 introduces the data set, variables and the statistical methods used. In section 4, results of the empirical analysis are discussed. Section 5 concludes.

2 Changes in the allocation to temporary employment

Previous empirical studies have shown that the risk of holding a temporary contract is related to various individual as well as job-related characteristics (a.o. Giesecke and Groß 2003; Schömann, Rogowski and Kruppe 1998). On a theoretical level, however, there are different explanations for these allocation patterns. One popular approach relates characteristics of workers (such as age, sex,

nationality or education) and of jobs (such as firm-size or sector) to temporary employment by referring to *labour market segmentation*. According to this line of reasoning, the labour market is divided into labour market segments (Doeringer and Piore 1985 [1971]), which differ in the kind of jobs they offer.¹ In the simplest version of this approach there is a primary segment offering well paid positions with good working conditions and structured career ladders and a secondary segment entailing short term, low-paid work providing no career prospects. In a further distinction, the primary labour market is differentiated into an upper and a lower primary sector (Piore 1978). While the upper primary sector is characterised by positions that require general skills and high levels of flexibility, the lower primary sector is dominated by positions that require firm-specific skills and long-term relationships. Given these structural features of the labour market temporary jobs can primarily be seen as elements of the secondary segment, where employers use temporary workers as a buffer stock to regulate short-term fluctuations in demand, but also as an important element of the upper primary segment, which exhibits high levels of flexibility.

As the number of potential determinants of temporary employment is rather large, we want to focus the following discussion on the effects of education, age and occupational class. These characteristics are important determinants of temporary jobs and constitute core elements of social stratification and inequality. With respect to education, there is a well documented nonlinear relationship between a worker's educational level and her risk of holding a temporary employment, with especially high risks for low educated persons without vocational training and for university degree holders (a.o. Giesecke and Groß 2003). This U-shaped pattern corresponds to the idea of highly educated persons with general skills being allocated to the upper primary labour market segment, workers with vocational skills being allocated to the lower primary segment and low educated workers being allocated to the secondary labour market.²

¹ There is considerable disagreement about the reasons for the emergence of these segments. While some argue that labour market segmentation arises because of costly monitoring and uncertain product demand (Saint-Paul 1996) or as result of an interaction of demand for specific skills, training on-the-job and firm-specific customs (Doeringer and Piore 1985 [1971]), others maintain that segmentation results from the employers' strategy of "divide and conquer" and thus helps to reproduce the hegemony of capitalism (Reich, Gordon and Edwards 1973).

² It should be noted that labour market segments are usually defined by characteristics of the jobs (stability, existence of career ladders etc.) and not by characteristics of employees. However, it is expected that employees showing certain characteristics are concentrated in "corresponding" labour market segments. Thus employees holding higher educational credentials can be found more often in the upper primary segment, while employees having high specific human capital – which is acquired through vocational training – can mostly be found in the lower primary segment. In the secondary labour market segment mostly employees without educational credentials or other disadvantaged groups as for example ethnic minorities can be found. From the assumption of the existence of such labour market segments we try to derive hypotheses about the effects individual characteristics have on the likelihood of being in temporary employment. We do not try to operationalise labour market segments. For example, the assumption that highly qualified employees can mostly be found in the upper primary segment does not mean that the upper primary segment is defined by this type of employees.

Besides education, a worker's age can be expected to be associated with the risk of holding a temporary contract. According to labour market segmentation theory, young persons will be more often found in the secondary labour market and, thus, confronted with a higher probability of getting a temporary job. Firms try to establish loose employment relationships particularly with young persons since they lack, in contrast to the more experienced workers, work experience and seniority because of their short employment history.³ This prediction is confirmed by previous studies for Germany, which show that the risk of holding a temporary contract is especially high for young persons (a.o. Buchholz and Kurz 2005; Schömann, Rogowski and Kruppe 1998).

Finally, the risk of holding a temporary contract can be assumed to vary with occupational class as sociological theory in general predicts different labour market risks across occupational classes. Goldthorpe (1995; 2000) distinguishes low-skilled jobs based on a labour contract and high-skilled jobs regulated by service relationships. Whereas the former are easily monitored and do not require firm-specific training, the latter are characterised by a high level of autonomy and the need of extensive firm-specific training. Thus, employers have an incentive to build up long-term commitments based on permanent contracts especially with higher-skilled classes. However, empirical evidence shows a more U-shaped pattern with higher risks for the higher service class as well as for unskilled workers (a.o. Buchholz and Kurz 2005).

Overall, we expect our empirical analysis to confirm the findings of previous studies on determinants of temporary employment. However, the central question of this paper is whether or not these allocation mechanisms have changed over time. From a theoretical point of view there are reasons to believe so as there have been different macro-structural and macro-institutional changes that might have affected the individual risk patterns. These changes are discussed in the next two subsections.

2.1 Structural changes

Several macro-structural trends have been summarised under the heading of *globalisation*. According to Mills and Blossfeld (2005: 189), globalisation stands for four interrelated structural shifts that have transformed the life courses in modern societies during the last two decades: the internationalisation of markets, increasing economic competition due to general liberalisation, the transition to a knowledge society accelerated through the increased use of information and communication technologies; and the rising importance of markets and their international interdependence. These combined trends induce structural uncertainty because increasing dynamics and volatility make future predictions less precise.

In the sociological literature there are two conflicting perspectives regarding the effects of increasing uncertainty on social inequality in the labour market. One assumption, that was put forward particularly

³ This argument is also in line with screening theory that expects that employers – due to incomplete information in the labour market – opt for temporary contracts as a form of prolonged probationary period especially for young persons (Riley 2001; Spence 1973).

by Beck (1992; 2000), relates global uncertainty to an *individualisation of social inequalities*. It is argued that existing determinants of social stratification like education and occupational classes will lose their importance for social inequality as new risks that are not related to these “classical” determinants will emerge. These new risks will cross boundaries of educational and occupational classes thereby equalizing the distribution of labour market risks. Labour market insecurity will hit all occupational and educational classes, i.e. the new uncertainties have a levelling effect on all individuals, irrespective of their class or resources. Following these arguments educational level and occupational class will lose their importance as determinants of individual labour market chances. Thus, the association between the risk of having a temporary contract and educational titles/occupational class positions will weaken. If “classical” dimensions of social inequality lose much of their predictive power, other factors that might be unobserved in standard surveys, will gain in importance. From a statistical point of view, this should be reflected by a decreasing association of those “classical” determinants with labour market outcomes, which would, for example, be manifested in a decreased goodness of fit of such models of social inequality. At the same time residual variance in those models might increase.

In contrast to the assumption of a growing individualisation of inequality, authors like Breen (1997) or Goldthorpe (2002) claim that the increasing uncertainty is shifted through pre-existing social inequalities of power and resources. In this perspective, employers try to shift the risks stemming from market uncertainties to groups that already used to have a weak labour market position. Thus, traditional social inequality patterns, such as those based on educational resources and occupational class, are expected to persist or even to increase.

With respect to flexible employment, Breen (1997) argues that employers try to transfer increased market risks stemming from growing markets volatilities to their employees (Breen calls this process a *recommodification of risks*⁴). Instead of developing long-term employment relationships, employers tend to use temporary employment contracts that guarantee the option to withdraw from employment contracts at any time. In this process, employees have to almost completely bear the increase in market risks by facing a higher degree of uncertainty regarding future job stability. This creates a “contingent asymmetric commitment” (Breen 1997: 477): employers can retain their workers when they are needed and get rid of them when they are no longer needed. However, even in times of high uncertainty, it is rational for firms not to transform all employment relationships into short-term ones. Employers still have an incentive to build up long-term commitments, especially with high-educated persons and employees in higher-skilled occupations to keep a stable, experienced, and high-qualified core workforce. Those long-term commitments with high-qualified persons are important to maintain because it is in general difficult to monitor exactly what those workers are doing whereas tasks of low-educated and unskilled workers can be closely supervised (Goldthorpe 1995). Thus, temporary con-

⁴ “Recommodification” means the opposite of Esping-Anderson’s (1990) notion of “decommodification” where, for example, welfare regimes acted to “decommodify” individuals by seeking to make their life chances less dependent on market forces.

tracts are assumed to be particularly used for those jobs with low skill requirements.⁵ Then, the relative probability of getting a temporary contract will increase for low educated workers and lower occupational classes compared to higher skilled workers.⁶ Mills and Blossfeld (2005) extend the argument of Breen (1997) to the dimension of age and expect that especially young persons as labour market outsiders are hit by increasing uncertainty compared to prime-age workers. Following this argument ,young workers' risk of holding a temporary contract will increase relative to the risks of other age groups.

According to the foregoing line of reasoning increased uncertainty will foster social inequality along existing lines of social division. Thus, the impact of determinants such as age, educational titles and occupational class positions on the risk of holding a temporary contract can be expected to have increased. As these characteristics get more important for social inequality, unobserved factors are likely to get less important for the allocation process to temporary jobs. In statistical terms, this implies an increasing goodness of fit of models using "classical" determinants of social inequality, while residual variance in those models might have decreased.

2.2 Institutional changes

It is often argued that the effects of structural changes like globalisation or skill-biased technological change are mediated through the national institutional setting. Economists maintain that these changes translate into high levels of low-skilled unemployment in Europe because rigid labour market institutions prevent the necessary wage adjustments (Blanchard and Wolfers 2000; Blau and Kahn 2002). In contrast, DiPrete et al. (2006) develop the sociological perspective that European labour markets have absorbed market uncertainties by allocating an increasingly large share of unskilled workers to flexible jobs.⁷ Following DiPrete et al. (2006), this trend has been induced by the deregulation of the usage of temporary work contracts as a new tool for redistributing labour adjustment costs. They can confirm their hypothesis for the case of France that is characterised by a deregulation of the usage of temporary contracts. Since French employers were not able to reduce the relative wages of low educated workers, they instead increasingly concentrated low educated workers in temporary jobs with low-adjustment costs. DiPrete et al. interpret this trend as a direct consequence of the interaction between the eased use of flexible employment contracts and macro-structural changes.

⁵ This trend is probably strengthened by organizational/technical changes, like an increased bureaucratisation of economic organisation in modern societies and skill-biased technological change, that increase the relative demand for high skilled workers (Acemoglu 2002). Other structural changes like educational expansion might have also altered the skill-related inequality structure of temporary employment. However, educational expansion was very low in Germany in international comparison and even weakened within our period of observation (Müller and Wolbers 2003). Therefore, we do not expect any significant influences from educational expansion on the skill structure of temporary employment in Germany.

⁶ According to Breen (1997), one can expect that certain groups like lower grade technicians and supervisors of manual workers have increasing risks because of organisational changes that ease monitoring, e.g. responsibility for profits to ever smaller units or performance targets. However, we can not differentiate these categories in our data. See section 3 for details.

⁷ In contrast, in the US, uncertainties have been compensated by rising skill-based inequality of wages.

Similar predictions can also be derived for the case of Germany. While permanent contracts are still highly protected, the usage of temporary contracts has been successively facilitated in Germany (OECD 2004). For example, the 1985 Employment Promotion Act and later law changes in 1996, 2001, and 2003 gradually extended the possibilities for temporary contracts by easing their application and renewals as well as prolonging their maximum duration (for details, see table A.1 in the appendix). This kind of partial labour market reform, with a relaxation of regulations against temporary employment but still high levels of protection of regular jobs, might be interpreted as an incentive for employers to increasingly use temporary contracts for employing low educated workers (Blanchard and Landier 2002; Esping-Andersen and Regini 2000).

Unions are another labour market institution that might shape the distribution of individual risk of getting a temporary contract. According to insider-outsider theory, unions represent collective interests of labour market insiders (Lindbeck and Snower 2002). Insiders, who have already gained permanent employment relationships in the (lower) primary labour market segment, have the strategy to prevent labour market outsiders from getting access to their privileged positions. In contrast, labour market outsiders, like young persons, are less represented in the negotiations of the social partners. Therefore, one can conclude that the stronger the representation of insiders' interests through unions, the lower is the chance for outsiders like young people to get permanent contracts. As unions' power has weakened over time in Germany (Ebbinghaus and Visser 2000), one can expect, *ceteris paribus*, a decreasing temporary employment risk for young workers.

In sum, there are theoretical arguments predicting weakening explanatory power of existing patterns of social inequality, particularly for such determinants as educational level and occupational position. Contrary to these arguments, there are predictions about a strengthening of social inequality along existing lines of social division. It is important to note that both lines of argumentation assume the expected shifts in the mechanisms in the process of allocating people to temporary jobs to result from macro-structural and macro-institutional changes. Unfortunately, the research design of this paper does not allow to fully disentangle the different macro-level influences. However, given the data it is at least possible to analyse the joint effects of these changes. Thus, the overall impact of macro-level changes on the allocation process to temporary employment relationships can be studied.

3 Research design

3.1 Data

For the empirical analysis we use data from German Labour Force Survey (Mikrozensus), covering the period from 1989 to 2005. This database provides standardised, cross-sectional information on individuals regarding labour force participation, employment characteristics, gender, age, education, occupational status, and employment history, among others. The sample size of the scientific use file corresponds to a random sample of 0.7 percent of the population residing in Germany containing more

than 500,000 observations for a given year. Compared to other micro datasets like the German Socio-Economic Panel, the Mikrozensus thus has the advantage of a large number of highly reliable observations. We restrict the sample to employees aged 16-65 who do not longer participate in education, i.e. we exclude students and apprentices. The analysis is limited to the time period 1989 to 2005 as the central information on contract status is missing prior to 1989. Unfortunately, we cannot use the Mikrozensus waves from 1990, 1992 and 1994, because these waves are not available for research. Since important information on job characteristics (such as firm size or occupational class) is not available in the data before 1996, the analyses of this paper are limited to the period 1996 to 2005 whenever job characteristics are investigated.⁸ Furthermore, we decided to restrict the analyses to the West-German labour market. Given the radical transformation process of the East-German labour market since 1990, a separate analysis would be necessary, which – interesting as it may be – would certainly go far beyond the scope of the paper.⁹

3.2 Variables

The central variable defining the type of employment contract is a binary indicator, coded 1 for temporary contracts and 0 in case of a permanent contract. Temporary employment is characterised by the agreement between employer and employee on objective conditions under which a job ends, such as a specific date, the completion of a task or the return of another employee who has been temporarily replaced. In particular, this applies to fixed-term contracts, workers with a contract for a specific task, occasional, casual or seasonal workers, as well as to some temporary agency workers.

The set of explanatory variables reflecting the determinants of the type of an employment contract contain individual and structural characteristics (for details see table A.2). As standard individual variables we include gender, nationality, age and education. Gender¹⁰ and nationality are dummy-coded whereas age is grouped in ten-years intervals (16-25, 26-35, 36-45, 46-55, and 56-65 years). To control for differences in educational attainment, we use information on the successful completion of different general and vocational educational levels which allow defining educational degrees according to the CASMIN classifications (Lechert, Schroedter and Lüttinger 2006). CASMIN has the advantage of combining information on the highest school degree and the highest vocational degree. This is especially relevant for the highly standardised and stratified German educational system with its high

⁸ Moreover, until 2005 standard occupational classifications (as for example ISCO) that are needed to code a person's occupational class is only available for the 0.45 percent subsample of the Mikrozensus. Thus, the sample size is reduced by more than half whenever this information is used in a statistical model. In order to have similar sample sizes, we draw a 45 percent subsample of the 2005 wave if we estimate models that include occupational information.

⁹ The Mikrozensus does not allow identifying those persons who are registered in job-creation measures (the so-called "Arbeitsbeschaffungsmaßnahmen"), which are temporary by definition. While those specific employment forms are important for the East German labour market, they are rather marginal for West Germany (Rudolph 2000).

¹⁰ For the sake of brevity, we only present results from models that were estimated for both men and women simultaneously. This is justified by the fact that taking into account gender-specific risk patterns by estimating separate models for men and women does not substantially alter our results. The results of these separate analyses are available on request from the authors.

degree of vocational specificity (Müller and Shavit 1998). The CASMIN categories have been summarised into six categories: elementary education (CASMIN 1a, 1b), elementary education with vocational training (CASMIN 1c), intermediate/higher secondary education without vocational training (CASMIN 2b, 2cgen), intermediate/higher secondary education with vocational training (CASMIN 2a, 2cvoc), higher technical college (CASMIN 3a), and university education (CASMIN 3b). Recent labour market history is approximated by the activity status one year prior to the survey. This variable differentiates between employment, unemployment, inactivity, and participation in education.

We also control for structural influences in the form of firm size and industry sector of employer. Firm size is differentiated in three groups: small firms (1-10 employees), medium-sized firms (11-50 employees) and large firms (more than 50 employees). Industry sector is measured according to nine aggregated NACE classification (see table A.2). Information on employment status in the public service is combined with the NACE classification as an additional sector category. All persons working in the public sector are coded into this additional category that is independent of their NACE classification. Occupational class differences are captured according to an aggregated version of Erikson and Goldthorpe's (1992) class scheme. The scheme differentiates between higher service (EGP I), lower service (EGP II), routine clerical (EGP IIIa), routine service/sales (EGP IIIb), skilled manual (EGP VI), and semi-/unskilled workers and agricultural workers (EGP VII). We derive EGP classes from ISCO-88 coded occupational titles following the procedure of Ganzeboom and Treiman (2003). However, we cannot fully implement the transformation due to data limitations of the Mikrozensus. For example, EGP V class of manual supervisors is missing because information about the supervisory status are lacking in the Mikrozensus. Self-employed persons are excluded by our sample selection definition.

3.3 Statistical methods

In order to analyse changes in the inequality structure of temporary employment we estimated binomial logistic regressions where the binary indicator of having a temporary contract is regressed on a set of explanatory variables as outlined above. These regressions are estimated for each year separately, thereby allowing us to compare logit regression coefficients over time. A simple strategy to investigate overall changes in the determinants of temporary employment over time is to compare measures of goodness of fit. Whereas in linear regressions the coefficient of determination R^2 is the standard concept, there is a huge variety of measures of goodness of fit for logistic regressions (Long 1997; Long and Freese 2006). Therefore, we choose the strategy to compare two distinct measures of goodness of fit in terms of a sensitivity analysis. First, we use a measure based on the concept of Pseudo- R^2 . The most popular Pseudo- R^2 is *McFadden's* R^2 that is defined as

$$R^2 = 1 - \frac{LL_M}{LL_0} \quad (1)$$

where LL_M is the likelihood of the full model and LL_0 is the likelihood of the constant-only model. However, it should be noted that this is only one specific calculation of Pseudo- R^2 out of a wide range

of possible measures (for a discussion see Long 1997: 102-113). Second, a different approach of assessing the fit of a model and for comparing models over time is based on Bayesian measures of information. For our analysis we use Akaike's Information Criterion (AIC) that is defined as

$$AIC = \frac{-2LL_M + 2P}{N} \quad (2)$$

where P is the number of parameters in the model, and N is the number of observation. The model with the smaller AIC is considered the better fitting model. Unlike McFadden's Pseudo- R^2 information measures such as the AIC have penalties for including variables that do not significantly improve the fit.¹¹

Finally, we implement two models that test for changes in the effect of age, education, and occupational class assuming a linear time trend. These models are estimated using the pooled Mikrozensus data. While one of these models is a standard logit model, the other is a heterogeneous choice model that takes into account changes in residual variance over time. Besides explicitly modelling a time-dependent residual variance, this model allows to counter potential bias stemming from heteroscedasticity (i.e. varying residual variance) in standard logit models. Whereas in the context of ordinary least squares regression heteroskedasticity does not bias the parameter estimates, this causes more problems in logit regressions. In case of varying variances of the error term, not only are the standard errors incorrect, but the parameters are also biased and inconsistent. In order to deal with these problems, heterogeneous choice model for logit model have been developed (Alvarez and Brehm 1995; Keele and Park 2006). Deriving the binary choice model in a latent variable framework (e.g. Wooldridge 2002), we have

$$\Pr(Y_i = 1) = \Pr(Y_i^* > 0) = \Pr(X_i\beta + \varepsilon_i > 0) = \Pr(\varepsilon_i \leq X_i\beta) \quad (3)$$

where Y_i is the observed binary indicator and Y_i^* represents the latent variable that depends on explanatory variables X_i and an error component ε_i . In the logit case this error term is assumed to follow a logistic distribution Λ . To estimate the standard logit model, it must be assumed that the error term is homoskedastic or constant such that

$$\Pr(Y_i = 1) = \Pr\left(\frac{\varepsilon_i}{\sigma} \leq \frac{X_i\beta}{\sigma}\right) = \Lambda\left(\frac{X_i\beta}{\sigma}\right) \quad (4)$$

The regression parameters will estimate the true coefficients only up to scale ($\hat{\beta} = \beta/\sigma$). Thus, if the assumption of a constant error variance is violated, for example because the error variance changes over time, than the parameter estimates will be biased. Accordingly, comparing logit coefficients across groups or time is invalid and misleading if residual variance varies (Allison 1999). For the

¹¹ We do not present results for other Pseudo- R^2 or information criteria because they do not alter the results in a significant way.

analyses of this paper the results from standard logit models might suggest that estimated logit coefficients have changed although the true coefficients remained stable but the residual variance changed over time. It is even possible that estimated coefficients remain stable over time although the true values have changed (and vice versa) and this has been countervailed by changing residual variation. In contrast to standard logit models, heterogeneous choice models assume that the error variance varies systematically (for an overview, see Keele and Park 2006; Williams 2007). The variance component in heterogeneous choice models is modelled parametrically as

$$\text{var}(\varepsilon_i) = \sigma_i^2 = [\exp(Z_i\gamma)]^2 \quad (5)$$

where Z_i are variables that explain the changing variance. The Z_i 's and X_i 's need not to include any of the same variables, although they can. Then, the changed probability distribution is written as

$$\Pr(Y_i = 1) = \Lambda\left(\frac{X_i\beta}{\exp(Z_i\gamma)}\right) \quad (6)$$

Maximizing the log likelihood of the heteroscedastic logit model will produce unbiased and consistent estimates of the true coefficients β if the residual variance equation (5) is well specified.¹²

¹² For a detailed discussion of the model's statistical properties see Keele and Park (2006).

4 Empirical results

The empirical section of the paper is divided into two parts. The first subsection provides a brief overview of the development of temporary employment in the West German labour market during the last decades. Furthermore, shares of temporary employment for different age groups, educational levels and occupational classes are presented in order to cast a first glance at the distribution of temporary jobs across these social groups. This very descriptive section complements the second part which discusses the results of models that simultaneously relate the risk of holding a temporary contract to characteristics of the worker as well as to features of the job. These models are intended to provide statistically robust tests on the changing impact of “classical” determinants of temporary employment.

4.1 Some stylised facts on temporary employment in West Germany

This first descriptive section provides some stylised facts on the development and structure of temporary employment in West Germany. Table 1 presents the overall share of temporary employment of selected years in the period 1989-2005. Furthermore, group-specific shares for certain demographical and educational groups as well as occupational classes are reported. Due to the cross-sectional design of the Mikrozensus, the shares refer to the stock of temporary workers recorded on a reference day, rather than on the total number of employment contracts in force during a particular year.

Table 1 shows that the share of temporary workers has remained fairly constant during the 1990s varying in the 5 to 6 per cent interval. After 1989, there was a slight decrease to a share of 5.2 percent in 1993 when the post-unification boom ended, whereas the share increased again to 6.2 percent in 2001. In the new millennium, the slight upward trend continued and reached a maximum of 7.3 percent in 2005. Overall, these figures suggest that the changes in the regulation of the use of temporary contracts (see table A1 in the appendix) did not lead to a massive increase in the shares of this type of employment. Obviously, German employers gain flexibility not only by employing their staff on a temporary basis. However, looking at the group-specific shares of temporary jobs, it becomes clear that labour market flexibilisation did not affect the work force in a universal way, but rather mainly hit those labour market groups whose positioning was already weak.

With respect to the risk differentials between age groups, the findings displayed in table 1 confirm the results of previous research: The risk of holding a temporary contract is highest for young workers and lowest for older employees. Comparing these differentials over time reveals a strong increase of the age-related inequality in the risk of being temporarily employed. As can be seen from table 1, the risk of holding a temporary contract for persons aged between 16 and 25 more than doubled during the

observation period and reached a rather high level of 24.7 percent in 2005.¹³ Given the relatively constant overall share, this implies that the relative risk has increased substantially for young persons.

Table 1: Risk of temporary employment by selected demographic and educational groups (in percentages)

	1989	1993	1997	2001	2005
All	5.6	5.2	5.4	6.2	7.3
<i>Age</i>					
16-25 years	11.4	13.8	14.7	18.1	24.7
26-35 years	7.0	5.9	7.1	7.9	10.6
36-45 years	3.4	3.3	3.9	4.7	5.5
46-55 years	2.8	2.3	2.3	3.1	3.3
56-65 years	2.9	2.4	2.5	2.8	3.2
<i>Education</i>					
Elementary	5.7	4.8	5.7	7.2	8.5
Elementary + voc	3.8	3.3	3.4	4.1	5.1
Intermediate/full secondary	15.4	16.7	12.0	12.4	13.7
Intermediate/full secondary + voc	5.5	4.8	4.7	5.2	6.6
Higher technical college	5.3	3.7	5.4	5.3	6.3
University	12.3	11.0	12.4	12.4	12.0
<i>Occupational Class^{a)}</i>					
Higher service			9.4	8.9	9.6
Lower service			4.6	5.2	5.7
Routine clerical			4.7	5.5	6.4
Routine service and sales			4.6	5.8	7.1
Skilled manuals			3.5	4.1	5.8
Semi- and unskilled manuals			5.4	6.4	7.7

Source: Authors' own calculations based on Mikrozensus 1989-2005 data.

Remark: ^{a)} information on occupational class were not available in the data before 1996 (see section 3.1)

There is also a significant variation in temporary employment shares across educational groups. Interestingly, there are only small differences between the primary, secondary and tertiary educational level. However, at all educational levels holders of vocational qualification certificates are less likely to be temporarily employed. For example, the temporary employment share for persons with intermediate or full secondary education without vocational qualification is about three times larger than the share of those with vocational qualification. At the tertiary level, the proportion of university degree holders with temporary jobs is twice as high as the corresponding proportion of graduates from higher technical colleges, which are more vocationally oriented. The positive vocational effect also exists on the primary level, but it is less pronounced. These findings are in line with those from previous research. Regarding time trends, we find that – starting in the mid 1990s – at the primary level both persons with vocational and general education faced an increasing risk of holding a temporary con-

¹³ It should be noted that we excluded apprentices from our analysis. Thus, the share of temporary jobs does not simply reflect the higher proportion of apprentices holding temporary contracts in the age group 16-25 years.

tract. At the same time, the corresponding risk for general educated persons on the secondary and tertiary level decreased slightly. While this implies a convergence in education-related temporary employment risks, it is the labour market position of those with low qualification that has worsened during the last ten years.

Level differences are less pronounced along the occupational class dimension. It turns out that occupational positions belonging to the higher service class are on average more likely than other positions to be connected to temporary jobs. Detailed inspections on the occupational level (not shown) reveal that this higher incidence of temporary jobs is especially due to professionals within the higher service class. Furthermore, besides positions of the higher service class, those of the semi- and unskilled manual class are more likely than others equipped with temporary contract. This U-shaped risk pattern, which was also found by previous research (a.o. Buchholz and Kurz 2005), is somewhat at odds with the idea that employment contracts are different for occupation of the service class and those of the manual classes (Goldthorpe 2000). The discrepancy between the higher service class and other occupational classes vanished slightly during the observation period because all other classes registered an increasing risk of holding a temporary contract. However, the increase is particularly pronounced for the lower occupational classes, which indicates growing labour market risks for workers in those occupational positions.

In sum, we can confirm the social risk patterns of temporary employment that have been found in the existing literature: Young persons, holders of more generally oriented educational certificates, and employees of the higher service/the semi- and unskilled manual class face higher risks of holding a temporary contract when compared to other social groups. Regarding descriptive time trends, we find that the risk of holding a temporary contract seems to have increased across the age dimension. This is in line with the prediction of Mills and Blossfeld (2005) that extends the argument of Breen (1997) to young persons and expect that especially young persons as labour market outsiders are hit by increasing uncertainty. We can also confirm the prediction of DiPrete et al. (2006) who argue that European labour markets have absorbed market uncertainties by allocating an increasingly large share of unskilled workers to flexible jobs. As the risk of holding a temporary contract increased for workers with lower education and from lower social classes, these groups lost much of their relative advantage against workers holding a university degree and those from the higher service class, respectively, who used to face the highest risks of holding a temporary job. Overall, the results of the descriptive analysis suggest that social inequality is increasing along existing lines of social division. Though this most clearly holds for the age division of temporary employment risks, inequality patterns across educational groups and occupational classes have changed in such a way that the risks have increased for weak labour market groups.

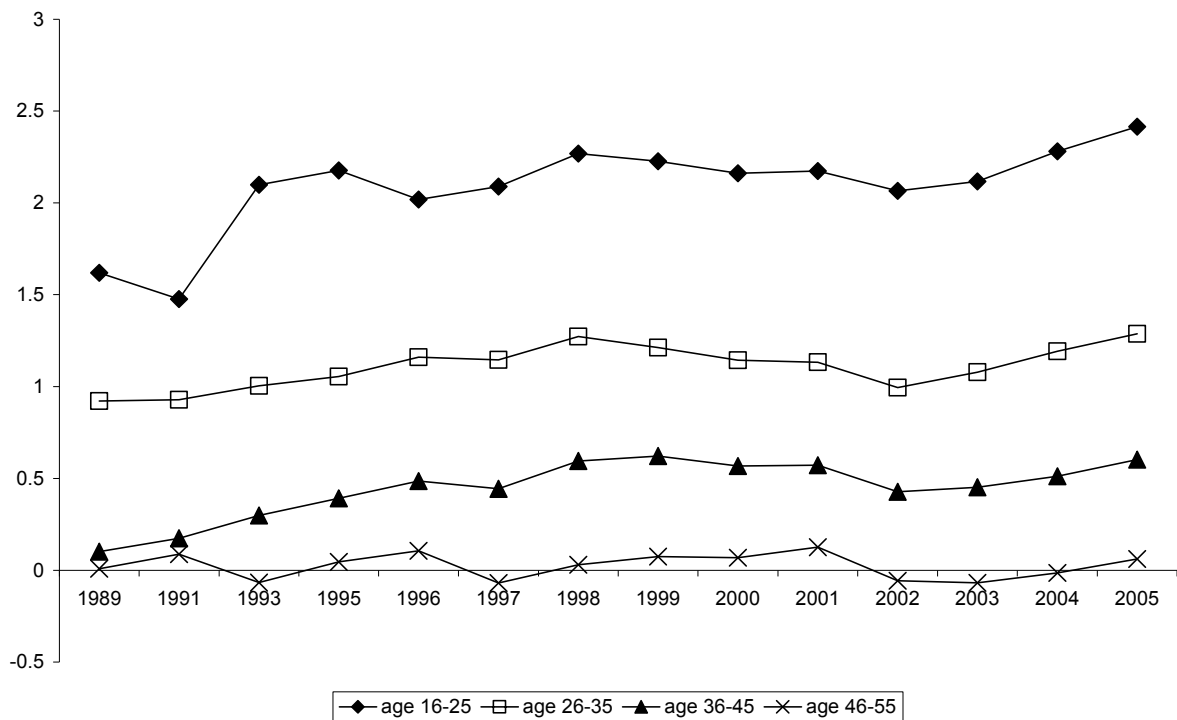
4.2 Changing risk patterns of temporary employment?

In the second part of our empirical analysis, we investigate the determinants of temporary employment at the individual level. We start with binominal logit models estimated separately for each year in the period from 1989 to 2005. Since some explanatory variables, like occupational class, firm size or last

year activity, are missing in the period from 1989 to 1995 (see section 3.1), we estimated, in a first step, a basic specification with education, age, gender and nationality as explanatory variables for the period 1989 to 2005.¹⁴

The age-specific risk of holding a temporary contract is shown in Figure 1. In line with the existing empirical evidence, we can confirm the general pattern that the older the person the lower her risk of holding a temporary contract. Especially the youngest age group has a significantly higher risk of holding a temporary contract compared to all other age groups. Thus, young workers lacking work experience, seniority, and networks are more likely to find themselves in temporary jobs than in permanent ones. The size of the logit coefficients presented in Figure 1 has no direct clear interpretation, but they can easily be transformed into odds ratios. For example the logit coefficient of 2.42 for persons aged 16 to 25 in 2005 implies an odds ratio of 11.45 ($e^{2.42}$) indicating that their risk of holding a temporary instead of a permanent contract is about eleven times as much as the risk faced by persons aged 56 to 65.

Figure 1: Logit coefficients for age groups, basic specification 1989-2005



Source: Authors' own calculations based on Mikrozensus 1989-2005 data.
Remark: Oldest age group (56-65) represents the reference group.

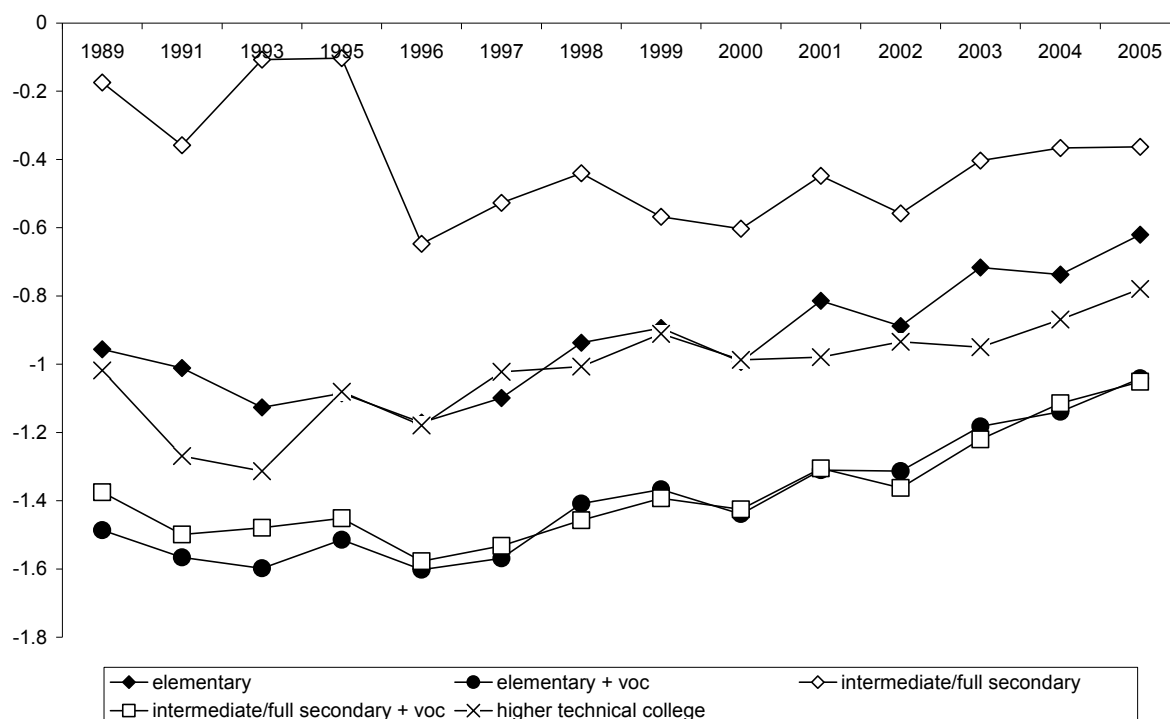
¹⁴ Logit coefficients are derived from standard logistic regression that rest on the assumption of a time-constant residual variation (see section 3.3 for more details). Since the estimated coefficients do not substantially differ from those obtained from heteroscedastic choice models, which explicitly take into account changes in residual variation over time, we present results from the standard logit models only. Furthermore, only the coefficients of age, education, and class are shown as these variables are of key interest in this paper. Detailed estimation results are available upon request.

With respect to the changes in the impact of age on the probability of being temporarily employed, the results clearly indicate that age differentials increased over time. For example, the logit coefficient for the age group 16-25 increased from 1.69 to 2.42, which corresponds to an increase in the odds-ratio from 5.42 to 11.45. Thus, there is a strengthening of the association between temporary employment and age. This finding is in line with the descriptive evidence and it is valid even after controlling for a set of demographic characteristics. This confirms the predictions of Mills and Blossfeld (2005) and contradicts the idea that a weakening of unions' power has decreased the insider-outsider cleavages.

Figure 2 displays the logit coefficients for different educational groups where university education is the reference category.¹⁵ The results indicate that – after controlling for basic demographic characteristics – when compared to workers holding university degrees all other educational groups face a lower risk of holding a temporary. This is especially the case for people with intermediate/full secondary education combined vocational training as well as individuals with elementary education combined with vocational training. But also graduates from higher technical college and even workers holding only elementary certificates face a lower risk of holding a temporary contract when compared to university graduates. For example, the logit coefficient of -1.041 for persons with elementary education and vocational training in 2005 implies an odds ratio of 0.353 ($e^{-1.041}$) indicating that their risk of holding a temporary instead of a permanent contract is about one third as much as the risk faced by persons with university education. These results underline the findings of the descriptive analysis: The level of education does not seem to matter much for the risk of holding a temporary job. Rather it is the completion of vocational training that matters, which is in line with the results of previous studies (a.o. Giesecke 2006; Giesecke and Groß 2003).

Regarding the trend of coefficients over time, one can detect a convergence in education related temporary employment risks. Especially those with elementary education (without and with vocational training) and those with intermediate/full secondary education with vocational training faced an increasing risk and lost much of their relative advantage compared to persons with university education. As in the descriptive analysis, the evidence from the multivariate analysis confirms the general prediction of DiPrete et al. (2006) who argue that European labour markets have absorbed market uncertainties by allocating an increasingly large share of low-educated workers to flexible jobs. Our findings clearly suggest an increasing risk for low educated workers in Germany as DiPrete et al. (2006) have found it for France. The difference is, however, that in Germany university graduates face the highest relative risk of holding a temporary contract. Therefore, the increasing risk for low educated workers translates into a convergence in education related temporary employment risks in Germany. In contrast, in France, university graduates face a lower relative risk of holding a temporary job. Thus, in the French labour market the increasing risk for low educated workers translates into increasing education differentials in temporary employment risks.

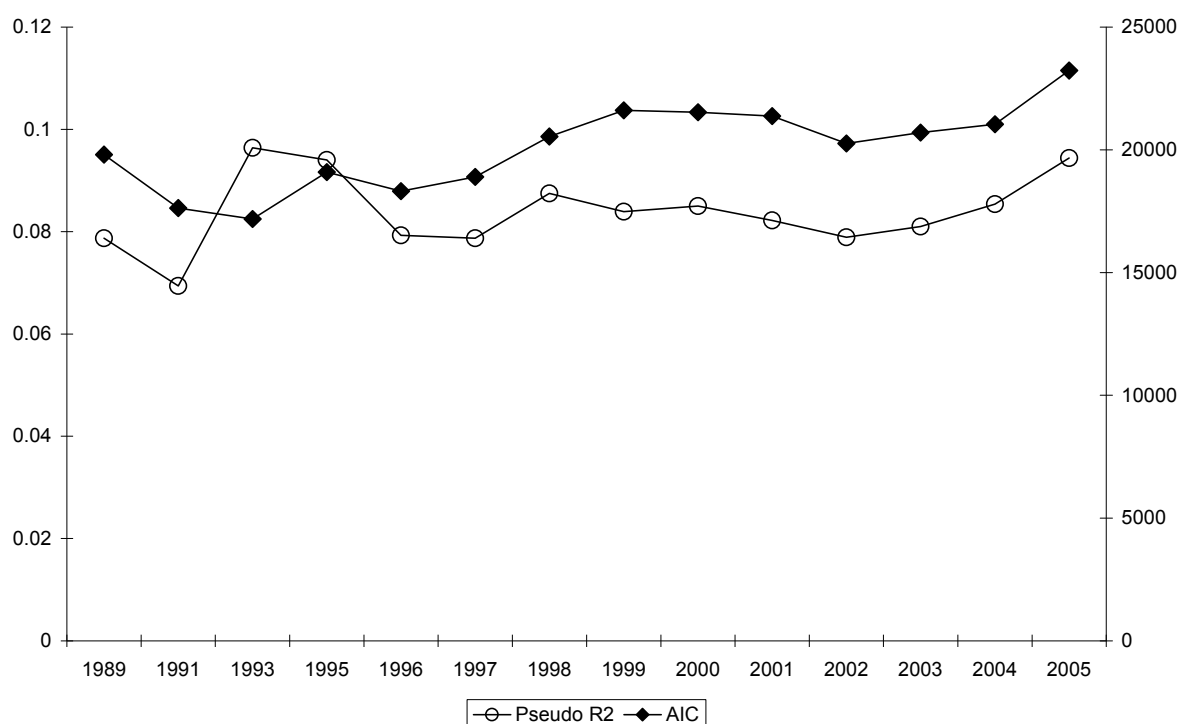
¹⁵ Because in this specification all variables that might be an outcome of education (e.g. firm size or occupational class) are excluded, we evaluate possible changes in the gross effect of education on the risk of holding a temporary contract.

Figure 2: Logit coefficients for educational groups, basic specification 1989-2005

Source: Authors' own calculations based on Mikrozensus 1989-2005 data.

Remark: University education represents the reference group.

Given these results, the question arises to what extent the weakening education differentials and the strengthening age differentials have affected the overall nexus of the "classical" determinants and temporary employment. In order to assess the predictive power of our baseline specification, we compare two measures of goodness of fit, Pseudo-R² and AIC. To assure comparability of measures of goodness of fit over time we repeated the analysis from above but drew a random sample with a size of 50,000 persons for each year. The results of these calculations are displayed in Figure 3. As can be seen from figure 3 there is no clear evidence of a decreasing or an increasing association of the individual characteristics used in the model and the risk of holding a temporary contract. Looking at the Pseudo-R² measure, the association of the individual characteristics and temporary employment seems to have slightly increased between 1989 and 2005. In contrast, the development of AIC suggests a slight decrease of the model fit. Thus, the measures of fit do not provide clear-cut results regarding changes in the predictive power of the basic model specification.

Figure 3: Measures of goodness of fit: Pseudo-R² and AIC, basic specification 1989-2005

Source: Authors' own calculations based on Mikrozensus 1989-2005 data.

Remark: Random samples of size 50,000 drawn for each year to assure comparability of measures of goodness of fit over time.

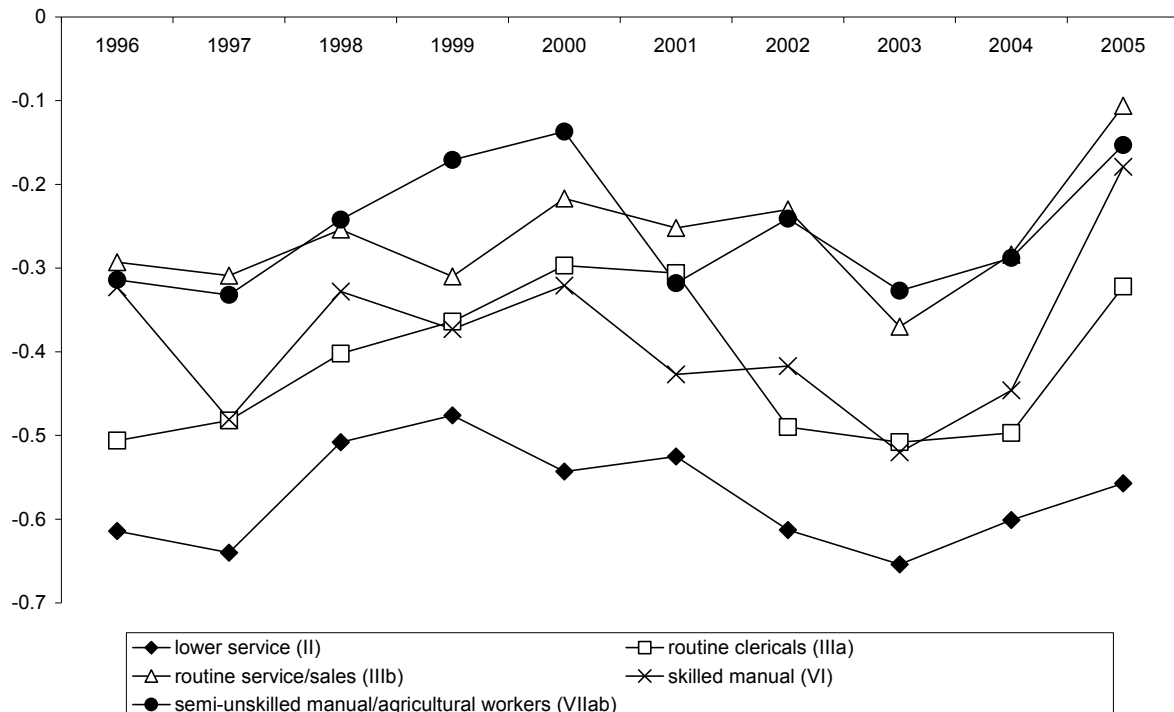
In a second step we estimated logit models that, in addition to individual characteristics, contained information about structural features as firm size, industry sector and occupational class as well as last year activity. Since the latter variables are only available from 1996 onwards, the observational period is shortened to ten years. The contribution of these models is twofold. First, they investigate the impact of structural characteristics on the risk of holding a temporary contract which is estimated net of the effects of job holders' individual characteristics. Thus, in contrast to the descriptive analysis it is possible to evaluate that part of the association of occupational class and temporary employment that is not due to the specific composition of the occupational classes (e.g. between-class differences in workers' average age or educational level) but to the specific structural characteristics of these positions. Secondly, by looking at measures of model fit it can be investigated whether or not the importance of structural factors in the allocation process to temporary jobs has changed over time.

Based on the full model specification, Figure 4 displays the estimated effects of occupational class on the risk of holding a temporary contract. The results indicate that compared to the reference group of higher service class positions occupational positions of all other classes exhibit lower shares of temporary jobs. This finding is similar to the results of the descriptive analysis. However, in contrast to these results, the multivariate analysis reveals that net of job holders' individual characteristics the risk of semi- and unskilled manual workers is not always higher than that of workers from other lower classes. At the same time positions of the lower service class seem to be least likely connected to temporary contracts. This higher chance of holding a permanent contract corresponds with the theoretical perspective, arguing that employers prefer permanent contracts to build up long-term employ-

ment relationships in order to keep a stable, experienced, and high-qualified core workforce. The high relative risk of occupational positions of the higher service class, which is not in line with this argument, can be mainly attributed to the disproportionately high risk of professionals, while managerial positions have a risk of being temporary that is comparable to that of other occupational classes (detailed analysis not shown).

With respect to changes in the effects of occupational class over time figure 4, does not provide evidence in favour of the assumption of an increasing risk of lower class positions. Though there is a slight convergence of the risk of holding a temporary contract between classes in the last two years, for the whole observational period there exists hardly any clear-cut time trend in the estimated effects of the occupational classes: Over the ten-year observational period occupational class related inequality structures show trendless fluctuations. This implies that despite structural and institutional changes during that time, there has been no increasing risk for workers of lower occupational classes to be employed in temporary jobs. Thus, these results contradict the predictions of Breen (1997), according to which the lower classes will be increasingly exposed to flexible employment relationships. Comparing these findings with those from the descriptive analysis reveals that the reported increase in the share of temporary jobs in lower occupational classes results mainly from the specific composition of these classes (i.e. higher shares of young and less educated workers) than from shifts in the risk differentials between occupational positions per se.

Figure 4: Logit coefficients for EGP classes, full specification 1996-2005



Source: Authors' own calculations based on Mikrozensus 1996-2005 data.

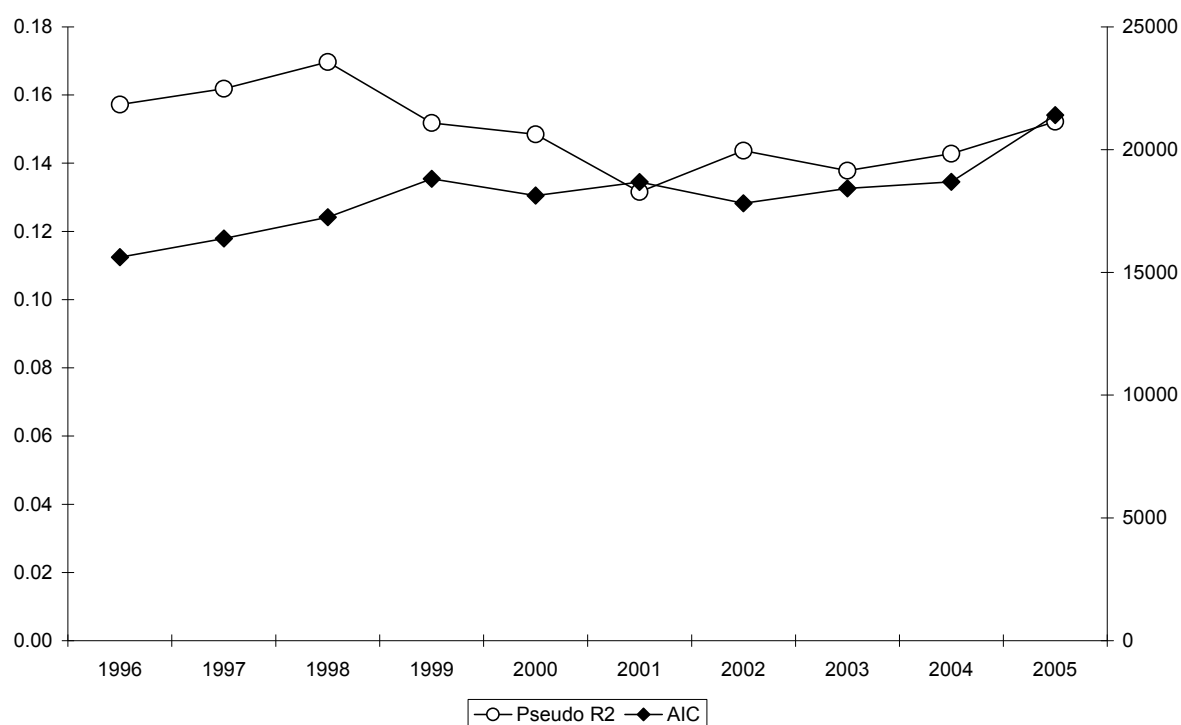
Remark: Higher service class (EGP I) represent the reference group.

The previous argument is underlined by looking at the effects of age and education in the full model specification (see table A.3 in the appendix for detailed information). Both age- and education-specific

risks of holding a temporary contract show the same order and time trends as in the case of the basic specification. This result implies that even after taking into account job-related factors such as firm size, industry sector and occupational class, the youngest age cohort as well as low educated workers are confronted with an increasing risk of getting a temporary contract.

In a next analytical step, the overall importance of individual and job-related characteristics for the process of allocating people to temporary employment relationships is evaluated. Again, the evaluation of the full model's predictive power is done by comparing the values of two different measures of goodness of fit (Pseudo-R² and AIC) over time.¹⁶ As can be seen from figure 5, both measures indicate a slight decrease of the variables' ability to predict a person's type of contract, albeit this trend is more pronounced for AIC than for Pseudo-R². This might be interpreted as a reduction of the importance of "classical" determinants of temporary employment, though the empirical evidence is far from being conclusive.

Figure 5: Measures of goodness of fit: Pseudo-R² and AIC, full specification 1996-2005



Source: Authors' own calculations based on Mikrozensus 1996-2005 data.

Remark: Random samples of size 50,000 drawn for each year to assure comparability of measures of goodness of fit over time.

In the last step of our analysis we estimated both a heterogeneous choice model and a standard logit model for the full model specification using the pooled data from 1996 to 2005. Estimating these models serves two purposes. First, the heterogeneous choice model allows one to specify and test changes in the residual variation. From theoretical reasoning the predictions about the way residual variation might have changed over time were not univocal. Empirically, the findings of the last subsec-

¹⁶ As in the analysis of the basic model specification, we drew random samples of equal size of 50,000 persons for each year in order to assure comparability of measures of goodness of fit over time.

tion suggest a slight decrease of the model fit over time, which might indicate an increase of residual variation. In order to test for changes in the residual variance, component we specified a heterogeneous choice model using a general linear time trend, i.e. residual variation is modelled as $\text{var}(\varepsilon_{it}) = [\exp(t\gamma)]^2$. As discussed in the section on statistical methods (3.3), an increase in the residual variation leads to a downward bias of the coefficients estimated in standard logit models and vice versa. Thus, the amount of temporal change in the impact of “classical” determinants on the likelihood of holding a temporary job might be overestimated in such models. Second, by pooling the data, we are able to conveniently test for time trends in the effects of age, education, and occupational class on the risk of holding a temporary contract. Up to this point, the temporal changes in these effects were discussed without referring to the question of statistical significance of the reported changes. In order to account for a time-varying impact of the observed characteristics on the risk of holding a temporary contract, all explanatory variables in the model are interacted with a linear time trend.¹⁷ Using this model specification, we are able to provide proper statistical tests on the empirical findings on changing allocation patterns discussed so far. In order to check the robustness of our results, we compare the estimates of a heterogeneous choice model with those of a corresponding standard logit model that neglects the issue of non-constant residual variation. Table 2 reports the estimation results of these models.¹⁸

Looking at the results displayed in Table 2, there are two points that should be particularly stressed here. First, with respect to the time trend in the residual variation, which is explicitly modelled in the heterogeneous choice model, it becomes obvious that residual variation has slightly increased over time at a rate of about one percent per year. However, this time trend is far from being statistically significant. This insignificance is also reflected in the values of the log likelihood that show no substantial improvement when comparing the heterogeneous choice model to the standard logit model which assumes a constant error variance. Thus, the data clearly rejects the assumption that the variation of unobserved factors of the risk of holding a temporary contract has increased over time. In statistical terms this result implies that the estimates of the standard logit model do not suffer from bias stemming from non-constant residual variation. This is reflected by the fact that, when comparing the two models, most of the estimated coefficients for the variables and their interactions with the time trend are quite similar. The major difference between the two models can be found in the sharply decreased t-values of those coefficients capturing time trends. This particularly holds for the estimated time trends of the educational groups, which are estimated with a higher degree of uncertainty in the heterogeneous choice model. Thus, the decrease in t-values is mainly due to inflated standard errors in the heterogeneous choice model. Given this difference and the finding of an insignificant time trend in the residual variation, we rely on the results of the standard logit model.¹⁹

¹⁷ In addition to these interaction terms, a general linear time trend is incorporated to account for a general increase in the risk of temporary contracts.

¹⁸ To ease convergence of the complex heteroscedastic choice model, we draw random samples of equal size of 50,000 persons for each year.

Table 2: Comparison of pooled logit and heterogeneous choice model, full specification 1996-2005

	pooled logit		heterogeneous choice	
	coeff.	t-stat	coeff.	t-stat
Time trend t	0.03**	(2.01)	-0.02	(-0.32)
<i>Age group (Ref. 56-65)</i>				
age 16-25	1.70***	(27.83)	1.69***	(25.91)
t*age 16-25	0.05***	(4.60)	0.08**	(2.08)
age 26-35	1.09***	(19.26)	1.09***	(18.68)
t*age 26-35	-0.00	(-0.04)	0.02	(0.70)
age 36-45	0.58***	(9.93)	0.57***	(9.60)
t*age 36-45	0.00	(0.16)	0.01	(0.68)
age 46-55	0.13**	(2.09)	0.13**	(2.05)
t*age 46-55	-0.01	(-1.21)	-0.01	(-1.10)
<i>Education (Ref. university)</i>				
elementary	-0.85***	(-15.88)	-0.86***	(-15.51)
t*elementary	0.03***	(3.03)	0.02	(1.46)
elementary + voc	-1.12***	(-23.48)	-1.12***	(-22.92)
t*elementary + voc	0.03***	(3.49)	0.02	(1.03)
intermediate/full secondary	-0.46***	(-8.02)	-0.47***	(-7.83)
t*intermediate/full secondary	0.00	(0.47)	-0.00	(-0.07)
intermediate/full secondary + voc	-1.22***	(-27.82)	-1.22***	(-27.13)
t*intermediate/full secondary + voc	0.04***	(4.89)	0.03	(1.47)
higher technical college	-0.96***	(-17.26)	-0.96***	(-16.86)
t*higher technical college	0.02*	(1.72)	0.01	(0.38)
<i>Occupational class (Ref. higher service (I))</i>				
lower service (II)	-0.57***	(-13.03)	-0.57***	(-12.69)
t* lower service (II)	0.00	(0.06)	-0.01	(-0.58)
routine clericals (IIIa)	-0.43***	(-8.19)	-0.43***	(-7.99)
t* routine clericals (IIIa)	0.00	(0.26)	-0.00	(-0.26)
routine service/sales (IIIb)	-0.30***	(-5.71)	-0.30***	(-5.56)
t*routine service/sales (IIIb)	0.01	(0.90)	0.01	(0.47)
skilled manual (VI)	-0.38***	(-6.88)	-0.38***	(-6.66)
t* skilled manual (VI)	-0.00	(-0.08)	-0.01	(-0.52)
semi-/unskilled manuals (VII)	-0.25***	(-5.09)	-0.26***	(-4.98)
t* semi-/unskilled manual (VII)	-0.00	(-0.16)	-0.00	(-0.46)
Constant	-3.26***	(-45.43)	3.26***	(44.21)
<i>Residual variation $\ln(\sigma^2)$</i>				
Time trend t			0.01	(0.88)
Log Likelihood	-102969.9		-102969.5	
N	571017		571017	

* p<0.10, ** p<0.05, *** p<0.01

Source: Authors' own calculations based on Mikrozensus 1996-2005 data.

Remark: Only selected coefficients are reported. In addition to these variables, the full specification contains information on activity status last year, gender, nationality, firm size, sector, and interactions with time for each variable.

With respect to the time trends in the effects of age, education, and occupational class, the results of the model using the pooled data confirm the findings of the previous subsections. As can be seen from Table 2, the risk of holding a temporary job is highest for the youngest age group. This risk has increased at a rate of 0.05 logit points, which corresponds to a 5 percent increase in the odds-ratio, per year. Thus age-differentials have clearly widened over the observational period. Regarding the educational level, the results reveal that almost all educational groups experienced an increasing risk of holding a temporary contract. This particularly holds for the elementary level as well as for the level of intermediate/full secondary education with vocational training. On the one hand, these results suggest that there has been a convergence in education related temporary employment differentials. On the other hand, this convergence implies a worsening of the labour market position of those workers holding degrees below the tertiary level. Finally, with respect to the impact of occupational class on the risk of holding a temporary contract, the results indicate no change in the effect of occupational class over time. This implies that the increase in class-specific shares of temporary employment found in the descriptive analysis above is solely due to the composition of these classes with respect to workers' individual and job-related characteristics.

5 Conclusion

Previous research on temporary employment relationships has revealed that this type of employment is related to serious socio-economic disadvantages – lower wages and higher unemployment risks of workers holding temporary contracts being only two examples for these disadvantages. At the same time these inferior labour market positions are not equally distributed across the work force as characteristics like age, education, and occupational class have been shown to be important determinants for an individual's probability of holding a temporary instead of a permanent contract. Whereas these allocation patterns are well documented by empirical studies, there is only little research on the question if and to what extent these patterns have changed over time. However, given the substantial structural and institutional changes that affected the German labour market during the last two decades, there are reasons to believe that risk patterns related to temporary jobs and thus the contours of social inequality itself have changed.

Based on data from the German Mikrozensus for the years 1989-2005, our empirical results indeed indicate that there have been changes both in the overall incidence of temporary contracts and in the specific risk of certain labour market groups to hold such a contract. On the aggregate level there has been only a modest increase in the overall share of temporary employment in the West German labour market over the last 20 years, which is an interesting result given the significant relaxation of regulations against the use of temporary employment during this time period. Obviously, the demand for this type of employment relations and thus the demand for higher external flexibility seems to be

¹⁹ It should be stressed here, that it is important to consider heteroscedastic choice models as part of those analyses that compare logit coefficients over time. Only if heterogeneous choice model show no significant changes in residual variation, as in our case, the use of conventional logit analyses is justified.

lower than thought by some commentators who refer to the level of employment protection as one of the main structural problems of the German labour market (Siebert 1997).

However, while the overall share of temporary jobs has only slightly increased, there clearly have been shifts in the risk of holding a temporary contract for certain social groups relative to other labour market groups. In particular, the results indicate that young persons as labour market outsiders faced an increasing risk of getting a temporary contract. In the observational period, the share of young persons aged 16-25 holding a temporary contract almost doubled, reaching about 25 percent in 2005. This result holds even after controlling for other individual and job characteristics. Thus, inequality in the distribution of temporary employment seems to have substantially deepened across the age dimension. This is in line with the predictions of Mills and Blossfeld (2005) who argue that young persons as labour market outsiders are particularly hit by increasing market uncertainties.

In addition to the strengthening inequality across age groups, the results reveal changes in the education-related inequality patterns. Especially those with elementary education (without and with vocational training) and those with intermediate/full secondary education with vocational training faced an increasing risk of holding a temporary job and lost much of their relative advantage when compared to persons with university education. This confirms the general predictions of DiPrete et al. (2006) who argue that European labour markets have absorbed market uncertainties by allocating an increasingly large share of low-educated workers to flexible jobs.

Overall, the empirical analysis revealed that particularly those individuals were increasingly allocated to inferior employment relations who belong to groups that already have had a weak labour market position – the young and the low educated. In addition, while the impact of these “classical” determinants shaped social inequality in the described way, there are no signs of a growing importance of other (typically unobserved) characteristics that determine an individual’s risk of holding a temporary contract (such as ability or motivation). Thus, these findings provide evidence of a strengthening of social inequality along the existing lines of social division and reject the notion of an inequality that is less and less socially structured.

Though the empirical analysis did not allow us to disentangle the effects of structural and institutional changes in detail, the findings seem to suggest that partial labour market reforms – such as lowering restrictions against the use of temporary employment while leaving the level of protection of standard employment relations unchanged – clearly bear the risk of reinforcing social inequality. The recent examples of France and Spain, where the relaxation of regulations against the use of temporary employment led to an intensification of labour market segmentation (Blanchard and Landier 2002; Polavieja 2006), might underline this argument. However, as the analysis of this paper is confined to the case of temporary employment, it remains an open research question as to what extent this conclusion is supported for other forms of flexible employment relationships as well.

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Appendix

Table A.1: Changes in the Regulation of the Use of Temporary Contracts in Germany 1985-2005

1985: Before 1985, fixed-term contracts could be used for a maximum duration of 6 months, and only for specific reasons like probationary period, special task completions, seasonal fluctuations, temporarily high volumes of work, deputization, on-the-job-training and public employment measures. The main law regulating temporary employment was the “Beschäftigungsförderungsgesetz” (Law for the Improvement of Employment Opportunities) of January 1985. Contract limitations up to 18 months were granted without specific reasons in certain cases, such as for a newly hired employee or successful apprentices wishing to continue their employment if a permanent position wasn’t available. Contracts could be signed up to 24 months without specific reasons in businesses smaller than 20 employees, providing there was no objective connection to a former contract within four months. A follow-up fixed-term contract was allowed in the case of specific reasons.

1996: The second improvement of the Employment Opportunities Act of 1996 extended the opportunities for using fixed-term contracts. The existing restrictions to newly hired employees and successful apprentices were removed. The maximum duration of a fixed-term contract was raised to 24 months, and within this period it could be renewed three times. The maximum duration for a fixed-term contract for employees over 60 became unlimited. However, it was not allowed to sign a fixed-term contract after a foregoing fixed-term or permanent employment with the same employer within 4 months. Nevertheless, it became possible to add a fixed-term contract without specific reasons to a fixed-term employment with specific reasons.

2001: In January 2001, Germany enacted a new law, the „Teilzeit- und Befristungsgesetz“ (Law of part-time and fixed-term employment relationship), which abolished the former Law for the Improvement of Employment Opportunities. The maximum duration of a fixed-term contract remained 24 months, and within this period it can be renewed three times. However, follow-up fixed-term contracts were forbidden if there was an earlier fixed-term employment contract between the employer and employee, regardless the bygone time. The age limit for older employees without limitations regarding the contract duration was reduced to 58. Anti-discrimination regulations guaranteed equal employment rights of fixed-term employees and open-ended employees with otherwise similar characteristics.

2003: Germany enforced some new regulations with the “Erstes Gesetz für moderne Dienstleistungen am Arbeitsmarkt“ policy in 2003, which allowed unlimited fixed-term contracts for employees over the age of 52. This rule does not apply if there was a foregoing fixed-term employment with the same employer within 6 months. The 2003 policy “Gesetz zu Reformen am Arbeitsmarkt” allowed new businesses to sign fixed-term contracts without specific reasons for a maximum duration of four years.

Table A.2: Variable definitions

<i>Variable name</i>	<i>Description</i>
<i>Age</i>	age group dummies
age 16-25	16-25 years old
age 26-35	26-35 years old
age 36-45	36-45 years old
age 46-55	46-55 years old
age 56-65	reference category: 56-65 years old
female	dummy for sex (1= female; 0= male)
german	dummy for nationality (1= German; 0= Non-German)
<i>Education</i>	classification according to CASMIN
elementary	inadequately completed elementary education or (compulsory) elementary education (CASMIN1a, 1b)
elementary + voc	compulsory education plus vocational training (CASMIN 1c)
intermediate/full secondary	intermediate or full secondary education without vocational training (CASMIN 2b, 2cgen)
intermediate/full secondary + voc	intermediate or full secondary education with vocational training (CASMIN 2a, 2cvoc)
higher technical college	technical College (University of Applied Sciences) (CASMIN 3a)
university	reference group: university (CASMIN 3b)
<i>Activity status last year</i>	dummies for activity status one year before
employed	reference group: employed
In education	in education
unemployed	unemployed
inactive	inactive
<i>Industry</i>	classification according to NACE revision 1.1 and public service information
agriculture	agriculture, hunting and forestry, fishing (NACE A, B); not in public service
manufacturing	reference group: manufacturing; electricity, gas and water supply (NACE C, D, E); not in public service
construction	construction (NACE F); not in public service
trade	wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods (NACE G); not in public service
hotels/restaurants	hotels and restaurants (NACE H); not in public service
transport/communication	transport, storage and communication (NACE I) ; not in public service
finance/real estate/renting	financial intermediation; real estate, renting and business activities, consulting (NACE J, K); not in public service
public administration/ education/health	public administration and defence; compulsory social security; education; health and social work (NACE L, M, N); not in public service
other services	other community, social and personal service activities; activities of households; extra-territorial organisations and bodies (NACE O, P, Q); not in public service
public service	employment in public service

Table A.2 (continued): Variable definitions

<i>Variable name</i>	<i>Description</i>
<i>Firm size</i>	
Firm size 1-10	dummy for firm size (1=1-10 employees; 0 else)
Firm size 11-50	reference category: dummy for firm size (1=11-50 employees; 0 else)
Firm size >51	dummy for firm size (1=more than 50 employees; 0 else)
<i>Occupational class</i>	
higher service (I)	reference group: higher managers and professionals (EGP I)
lower service (II)	lower managers and professionals (EGP II)
routine clericals (IIIa)	routine clerical workers (EGP IIIa)
routine service/sales (IIIb)	routine service and sales workers (EGP IIIb)
skilled manual (VI)	skilled manual workers (EGP VI)
semi-unskilled manual (VIIab)	semi- and unskilled manual workers and agricultural labour (EGP VIIa and EGP VIIb)

Table A.3: Determinants of temporary employment, full specification, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat
<i>Age (Ref. 56-65)</i>										
age 16-25	1.57*** (14.2)	1.66*** (15.9)	1.86*** (17.8)	2.07*** (20.2)	1.97*** (19.5)	2.03*** (20.8)	1.96*** (19.9)	1.98*** (20.5)	1.96*** (20.9)	2.27*** (25.8)
age 26-35	1.04*** (10.2)	1.02*** (10.7)	1.15*** (12.0)	1.19*** (12.4)	1.12*** (11.9)	1.12*** (12.1)	1.03*** (11.1)	1.08*** (12.0)	0.98*** (11.2)	1.22*** (14.8)
age 36-45	0.50*** (4.7)	0.49*** (5.0)	0.58*** (5.9)	0.75*** (7.7)	0.62*** (6.5)	0.64*** (6.9)	0.56*** (6.1)	0.52*** (5.7)	0.50*** (5.7)	0.66*** (8.0)
age 46-55	0.20* (1.8)	-0.02 (-0.1)	-0.05 (-0.4)	0.20* (1.9)	0.09 (0.8)	0.24** (2.4)	0.06 (0.6)	-0.03 (-0.3)	0.03 (0.3)	0.12 (1.4)
female	0.04 (0.8)	0.01 (0.2)	0.09** (2.0)	0.09** (2.0)	0.10** (2.2)	0.04 (0.9)	0.15*** (3.2)	0.04 (0.8)	0.04 (0.8)	0.08** (2.0)
foreigner	0.73*** (11.3)	0.59*** (8.7)	0.36*** (5.4)	0.56*** (9.2)	0.41*** (6.5)	0.47*** (7.9)	0.47*** (7.6)	0.42*** (6.7)	0.43*** (6.9)	0.32*** (5.5)
<i>Education (Ref. university)</i>										
elementary	-0.81*** (-8.6)	-0.84*** (-8.9)	-0.78*** (-8.7)	-0.71*** (-8.1)	-0.97*** (-10.8)	-0.64*** (-7.5)	-0.67*** (-7.4)	-0.51*** (-5.8)	-0.69*** (-7.7)	-0.77*** (-9.0)
elementary + voc	-1.08*** (-12.8)	-1.02*** (-12.4)	-1.10*** (-13.8)	-0.98*** (-12.6)	-1.19*** (-14.9)	-1.01*** (-13.1)	-0.93*** (-11.5)	-0.76*** (-9.6)	-0.88*** (-11.3)	-0.87*** (-11.6)
intermediate/full secondary	-0.42*** (-4.1)	-0.49*** (-4.8)	-0.51*** (-5.1)	-0.43*** (-4.6)	-0.53*** (-5.6)	-0.45*** (-5.0)	-0.30*** (-3.2)	-0.40*** (-4.1)	-0.44*** (-4.6)	-0.49*** (-5.4)
intermediate/full secondary + voc	-1.16*** (-14.7)	-1.15*** (-14.9)	-1.24*** (-16.8)	-0.99*** (-14.1)	-1.19*** (-16.5)	-1.06*** (-15.4)	-1.05*** (-14.5)	-0.88*** (-12.5)	-0.87*** (-12.8)	-0.83*** (-12.7)
higher technical college	-0.98*** (-9.9)	-0.95*** (-10.1)	-0.94*** (-10.3)	-0.82*** (-8.7)	-0.92*** (-10.1)	-0.89*** (-9.2)	-0.82*** (-8.2)	-0.79*** (-7.9)	-0.96*** (-9.6)	-0.71*** (-7.8)
<i>Industry (Ref. manufacturing)</i>										
agriculture	0.60*** (2.8)	0.65*** (3.6)	0.74*** (4.1)	0.65*** (3.6)	0.67*** (3.8)	0.63*** (3.5)	0.68*** (3.7)	0.43** (2.2)	0.73*** (4.0)	0.54*** (3.0)
construction	0.13 (1.3)	-0.30*** (-2.7)	-0.08 (-0.8)	-0.05 (-0.5)	-0.14 (-1.4)	-0.16 (-1.5)	-0.04 (-0.3)	-0.16 (-1.4)	-0.13 (-1.2)	0.16 (1.6)
trade	-0.06 (-0.7)	-0.15* (-1.7)	-0.11 (-1.4)	0.11 (1.4)	-0.08 (-1.1)	0.09 (1.2)	0.12 (1.5)	0.16** (2.1)	0.09 (1.2)	0.19*** (2.8)
hotels/restaurants	0.26* (1.7)	0.28** (2.1)	0.27** (2.0)	0.43*** (3.5)	0.18 (1.4)	0.28** (2.3)	0.18 (1.4)	0.24* (1.8)	0.40*** (3.3)	0.17 (1.4)
transport/communication	0.10 (0.9)	-0.04 (-0.3)	0.00 (0.0)	-0.04 (-0.4)	0.13 (1.4)	0.14 (1.4)	0.07 (0.7)	0.01 (0.1)	0.05 (0.5)	0.30*** (3.0)
finance/real estate/renting	-0.14 (-1.4)	-0.17* (-1.8)	-0.05 (-0.5)	-0.10 (-1.2)	-0.24*** (-2.9)	-0.11 (-1.3)	0.03 (0.4)	0.04 (0.5)	0.16** (2.0)	0.14** (2.0)
public administration/education/health	0.71*** (7.6)	0.61*** (6.9)	0.63*** (7.4)	0.63*** (7.7)	0.53*** (6.5)	0.66*** (8.5)	0.62*** (7.5)	0.65*** (8.1)	0.57*** (7.0)	0.72*** (9.8)
other services	0.75*** (7.1)	0.60*** (5.6)	0.54*** (5.2)	0.58*** (5.7)	0.53*** (5.4)	0.48*** (4.8)	0.59*** (5.9)	0.70*** (6.8)	0.68*** (6.8)	0.64*** (6.9)
public service	0.90*** (13.8)	0.76*** (12.1)	0.70*** (11.4)	0.75*** (12.6)	0.70*** (11.6)	0.65*** (10.7)	0.83*** (13.2)	0.79*** (12.7)	0.83*** (13.5)	0.65*** (11.0)

Table A.3 (continued): Determinants of temporary employment, full specification, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat	Coef./t-stat
<i>Firm size (Ref. 11-49)</i>										
Firm size 1-10	-0.20*** (-2.8)	-0.16** (-2.4)	-0.33*** (-4.8)	-0.36*** (-5.4)	-0.33*** (-5.0)	-0.26*** (-4.2)	-0.25*** (-3.9)	-0.17*** (-2.7)	-0.30*** (-4.9)	-0.41*** (-7.2)
Firm size >51	0.11** (2.1)	0.09* (1.7)	0.10** (2.1)	0.20*** (4.0)	0.10** (2.0)	0.00 (0.0)	0.10** (2.0)	0.05 (0.9)	-0.02 (-0.4)	0.05 (1.0)
<i>Activity status last year (Ref. employed)</i>										
in education	2.02*** (23.2)	2.21*** (24.4)	1.96*** (22.6)	2.00*** (20.1)	1.69*** (17.1)	1.62*** (15.6)	1.77*** (15.9)	1.66*** (15.9)	1.71*** (15.2)	1.67*** (15.8)
unemployed	2.42*** (29.2)	2.56*** (32.0)	2.56*** (35.9)	2.46*** (32.5)	2.60*** (33.6)	2.50*** (31.3)	2.42*** (28.4)	2.52*** (31.9)	2.36*** (31.4)	2.62*** (38.0)
inactive	1.36*** (15.4)	1.44*** (18.8)	1.44*** (19.5)	1.30*** (17.9)	1.42*** (19.3)	1.29*** (17.6)	1.33*** (17.6)	1.26*** (15.9)	1.40*** (17.5)	1.53*** (18.9)
<i>Occupational class (Ref. higher service (I))</i>										
lower service (II)	-0.61*** (-7.9)	-0.64*** (-8.4)	-0.51*** (-6.9)	-0.48*** (-6.7)	-0.54*** (-7.5)	-0.52*** (-7.5)	-0.61*** (-8.5)	-0.65*** (-9.2)	-0.60*** (-8.7)	-0.56*** (-8.3)
routine clericals (IIIa)	-0.51*** (-5.4)	-0.48*** (-5.3)	-0.40*** (-4.6)	-0.36*** (-4.3)	-0.30*** (-3.5)	-0.31*** (-3.7)	-0.49*** (-5.7)	-0.51*** (-6.2)	-0.50*** (-6.0)	-0.32*** (-4.2)
routine service/sales (IIIb)	-0.29*** (-3.1)	-0.31*** (-3.3)	-0.25*** (-2.8)	-0.31*** (-3.6)	-0.22** (-2.5)	-0.25*** (-3.0)	-0.23*** (-2.7)	-0.37*** (-4.4)	-0.28*** (-3.5)	-0.11 (-1.4)
skilled manual (VI)	-0.32*** (-3.3)	-0.48*** (-5.0)	-0.33*** (-3.5)	-0.37*** (-4.2)	-0.32*** (-3.5)	-0.43*** (-4.8)	-0.42*** (-4.5)	-0.52*** (-5.7)	-0.45*** (-4.9)	-0.18** (-2.2)
semi-/unskilled manuals (VII)	0.31*** (-3.5)	-0.33*** (-3.8)	-0.24*** (-2.9)	-0.17** (-2.1)	-0.14* (-1.7)	-0.32*** (-4.0)	-0.24*** (-3.0)	-0.33*** (-4.0)	-0.29*** (-3.7)	-0.15*** (-2.1)
constant	-3.35*** (-26.0)	-3.07*** (-25.3)	-3.17*** (-26.1)	-3.37*** (-28.0)	-3.03*** (-25.6)	-3.06*** (-26.6)	-3.21*** (-27.2)	-3.13*** (-27.1)	-3.00*** (-26.8)	-3.15*** (-29.5)
N	58497	57337	57773	56819	57718	58190	57713	56332	55791	54792
Pseudo R ²	0.155	0.163	0.167	0.150	0.151	0.137	0.140	0.140	0.141	0.154
AIC	18170	18795	19797	21270	20890	21763	20499	20567	20894	22958

Source: Authors' own calculations based on Mikrozensus 1996-2005 data.

Remark: * p<0.10, ** p<0.05, *** p<0.01