An Econometric Evaluation of Hiring Subsidies for Older Workers in Germany

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Abstract: This paper reports results from an evaluation of the Integration Supplement (Eingliederungszuschuss), a hiring subsidy for older workers introduced in 1998. We examine whether eligible persons exit earlier from unemployment to employment than in the situation in which no subsidies are available. Deadweight effects of the subsidy could mean that the employment effect is zero even if a substantial number of employment relationships are subsidised. Using a natural experiment design and the most comprehensive register data base available in Germany, the Integrated Employment Biographies (IEB), our point estimates suggest that these deadweight effects were small and that jobs created for members of the target group were additional for this group. This does not, however, preclude the existence of substitution and displacement effects.

JEL-Codes: J 64, H 24, C 31

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1 Introduction

There has been much discussion concerning the situation of older unemployed workers in Germany for a number of years. Older workers are often perceived by companies as less productive and less flexible and yet more costly to employ than younger workers (Bellmann et al., 2003; Boockmann and Zwick, 2004; Koller and Gruber, 2001). As a consequence, unemployment numbers and unemployment durations are high among older workers, in particular during periods of extended unemployment benefit durations (Fitzenberger and Wilke, 2004). Different active labour market policies have been introduced in order to improve the employment situation of older workers. In this paper, we are concerned with the Integration Supplement (Eingliederungszuschuss, or EGZ), a hiring subsidy[1] paid to the company over a fixed period of time. The Integration Supplement has been available from 1998 to support hiring of workers with unfavourable individual labour market characteristics. With a total spending volume of 0.9 to 1.3 billion € per year, it is one of the major active labour market programmes in Germany, accounting for roughly 5 per cent of all active labour market spending (Caliendo and Steiner, 2005).

With the exception of Jaenichen (2002), hiring subsidies have so far not been subject to evaluation studies conducted at the individual level in Germany due to a lack of suitable data. Our study is the first to be based on the universe of individuals eligible for the Integration Supplement. It uses official register data from the Federal Employment agency. This means that we avoid measurement errors usually encountered in survey data and have information on the universe of people potentially affected by the measure. In the following, we concentrate on the Integration Supplement for older workers. This constitutes a separate programme within the Integration Supplement. Eligibility is tied to age and other criteria which can be directly observed in the data. Therefore, a change of these criteria can be used as the basis of a natural experiment revealing the causal effect of the subsidy.

Hiring subsidies raise two different policy questions that should be distinguished (see, for instance, the survey by Marx, 2001):

- Do hiring subsidy programmes lead to earlier exit from unemployment to employment in the group of eligible persons as compared to the situation in which no subsidies are available?

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[1] Hiring subsidies should be distinguished from wage subsidies. According to Orszag and Snower (2003), hiring subsidies are targeted at the unemployed and provided only for a limited period of time while wage subsidies are paid to employers for an indefinite period and are meant to promote employment of all workers below a certain wage level.

- Do subsidised hirings causally lead to more unsubsidised employment?

The second question is asked in most evaluation studies on active labour market policies in general, and hiring subsidies in particular. Examples for empirical studies of hiring subsidies in this vein include, for instance, Forslund et al. (2004), Sianesi (2003), and Hujer et al. (2002).

In this paper, we are exclusively concerned with the first question, which has often been neglected in the literature. The interest here is in whether or not subsidies are effective in the sense of changing employers' hiring behaviour. The treatment is defined as the eligibility for programme participation, and the outcome is exit from unemployment or entry into a job. If the likelihood of a transition among individuals in the treatment group is unchanged by the treatment, the programme is regarded as ineffective. In a sense, this question can be seen as a precondition for asking the second: evaluating the effects of subsidised hiring on regular employment seems pointless if hiring behaviour is unaffected by the subsidy. Hence, the first question is fundamental to the understanding of the kind of treatment considered in the second question.[2]

There are a number of reasons why hiring subsidies may fail to have an effect on the number and composition of hirings. The most important reason is the presence of deadweight effects (Buslei and Steiner, 1999; Hujer and Caliendo, 2003; Meyer, 1995a). A deadweight effect occurs if employers collect the subsidy but hire the same individuals they would have hired had the subsidy programme not been available. Hiring may also be unchanged if financial incentives are too low, administrative costs are too high, or companies are unaware of the subsidy programme (Marx, 2001). The presence of these other reasons apart from deadweight effects can best be detected in implementation studies (see section 2 below). Deadweight effects, by contrast, involve a counterfactual that must be estimated.

In the absence of experiments such as the unemployment insurance bonus experiments reported by Meyer (1995a), estimation requires quasi-experimental variation in the eligibility for hiring subsidies. In this paper, we use a change to the eligibility rules as a "natural" variation. Before January 1st, 2002, the Integration Supplement for older workers was only available for hiring long-term unemployed workers. As a part of the "JobAqtiv-Gesetz" adopted in 2001, this condition was

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2   Jaenichen (2002) matches a control group of unemployed individuals to workers supported by the Integration Supplement and compares subsequent unemployment experience across these groups. This approach has elements of both policy questions asked above. However, the causal effect of the subsidy on exit from unemployment or the employment state shortly after exit cannot be dealt in this way be-cause all treated individuals are, by definition, in employment.

dropped. Hence, hiring of all workers above the age threshold of 50 years could be supported by the subsidy.

Our approach is to compare the ensuing change in employment prospects among workers aged 50 to 52 to the corresponding change in the group of unemployed workers aged 48 or 49. Hence, treatment consists in the possibility of subsidised employment, rather than in the support by the programme itself. In a second step, we compare the estimated number of additional hirings to the number of subsidies granted. The difference between these numbers can be interpreted as a measure of the deadweight effect.

Apart from the deadweight effects, there is the question of whether hiring of individuals in the treatment group is crowding out employment among persons not eligible to the Integration Supplement. This could take the form of a substitution or a displacement effect, depending on whether substitution occurs within the company or the employer or by market participants. These substitution effects are easily conceived in a simple static model of labour demand (Hujer et al., 2002). Even if substitution is taking place, however, labour demand does not necessarily fall among non-treated workers because of the presence of a scale effect: production is expanded if costs of labour as a whole decline. Firm-level or aggregate data may be used to assess whether substitution at the company level or crowding-out at the economy level is present. Using data from the IAB establishment panel, Hujer et al. (2002) do not find net overall employment effects of job creation measures at the firm level in the long run (i.e., over a period of three years). This suggests that if any effects are found at the individual level, they are due to firm-level substitution of subsidised and unsubsidised labour rather than due to employment creation.

Both substitution and displacement effects, on the one hand, and deadweight effects, on the other, are important for designing public policy since active labour market programmes are costly and taxes needed to finance them are distortionary (Buslei und Steiner, 1999). The particular interest in the deadweight effect, apart from being the logical first step in a comprehensive evaluation of programme effectiveness, is whether the programme is effective for the targeted group. In order to promote employment of certain population groups, for instance, policy-makers may be inter-ested in this question even if overall employment effects in the population are zero.

Ours is the first study to assess the magnitude of the deadweight effect using register data specifically provided for this purpose. This is an important advantage since the sample sizes of public use data files are far too small to provide a suitable database for our evaluation design.

The paper is structured as follows. In the next section, we describe the Integra-tion Supplement for older workers in detail and place it into the context of German

active labour market policies. Next, we introduce the data set and explain how labour market states are defined. Section four outlines our estimation approach and discusses its potential problems. Empirical results are presented in section five, and further discussion is contained in a final section.

2 Description of hiring subsidies in Germany

Hiring subsidies are one of the major instruments of German active labour market policies. Up to 1998, there existed several parallel programmes: Structural Adjustment Measures (Strukturanpassungsmaßnahmen, SAM) for East Germany, Employment Support for the Long-Term Unemployed (Beschäftigungshilfen, Bhi), the Integration Contract (Eingliederungsvertrag), subsidies paid under the Employment Promotion Act (Arbeitsförderungsgesetz), hirings subsidies for younger persons (Jugendsofort-programm, JUMP) and the Integration Supplement for Start-up Companies (Eingliederungszuschuss bei Neugründung, EZN). Since 1998, the legal basis for hiring subsidies has been the German Social Code (SGB), Volume III, and, with the exception of the EZN, subsidy programmes other than the newly introduced Integration Supplement (EGZ) have been gradually phased out. The number of participants increased markedly after 1998 and reached a high in February 2003, when more than 160,000 workers were employed in a contract supported by the EGZ (see figure 1). As in other active labour market programmes, the number of participants has declined more recently. In September 2005, the number of workers in the programme was down to 60,000. The number of workers supported by the EGZ for older workers increased from 25,000 in January 2000 to 75,000 in February 2003.

The EGZ is paid to the employer as a percentage of standardised labour costs defined as the gross wage rate (as laid down in collective agreements) plus a lump-sum allowance for employer contributions to social security. If the employment relationship is terminated before a minimum period after the expiration of the subsidy, the employer is legally obliged to refund parts of the subsidy, although local employment agencies often refrain from enforcing this requirement. Rather, they tend to decline future requests for hiring subsidies by the same company as a sanctioning mechanism (ZEW, IAB and IAT, 2005: 149).

There is no legal claim to EGZ either by the worker or the employer. Rather, placement officers at the local employment agencies decide on programme participation. The purpose of the EGZ is to facilitate hiring of persons with individual disadvantages on the labour market. In 1998, three variants of the EGZ were defined: EGZ while adapting to the new job, EGZ for workers with placement difficulties and EGZ

for older workers. The law defined older workers as workers above the age of 55, but this limit was soon reduced to 50 years by an executive order.

Benefit duration and volume differ for these groups. Older workers were eligible to the highest amount of subsidies. The regular subsidy was defined as 50 per cent of standardised labour costs, paid over an interval of 24 months. If a specific reason could be provided, the amount could be increased to 70 per cent and the duration of payment extended to at most 70 months (however, the share of subsidy payments in wage costs had to be reduced after 24 months).

With the Third Law on Modern Services for the Labour Market (known popularly as Hartz-III law in Germany), the EGZ have been substantially redesigned. The main points of the reforms were to collect the different kinds of EGZ under a common framework, abolishing the distinction between the EGZ for older workers and programmes for other groups, and to give local employment agencies higher flexibility in administering the employment subsidies. Since our study is not concerned with the EGZ as currently applied, we refer the reader to ZEW, IAT and IAB (2005) for details on the reforms.

The natural experiment stems from a change to the eligibility criteria made before the Hartz reforms. Before January 1st, 2002, the EGZ for older workers could only be paid in case of hiring of a person who had been either long-term unemployed[3] or had been registered as unemployed for at least six months during the 12 months before hiring (German Social Code, Volume III, § 218). This limitation was repealed by the "Job-Aqtiv-Gesetz" in 2001. From January 1st, 2002, hiring of all unemployed workers above the age of 50 could potentially be subsidised by the EGZ.

The extension of the eligibility criteria may have contributed to the fact that the EGZ has been increasingly targeted at workers between 50 and 55 years of age. In 2000, this age groups accounted for 44.6 per cent of all employment relationships subsidised by EGZ. In 2003, this number had increased to 63.5 per cent (ZEW, IAB and IAT, 2005: Statistical Appendix). This reflects a growing tendency within this period to disburse the subsidy in cases of less severe labour market disadvantages.

The implementation of the programme is extensively discussed in ZEW, IAB and IAT (2005). The implementation part of this report, conducted by the Institute for

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3   The definition of long-term unemployment is contained in § 18 of the German Social Code, Volume III: "(1) The long term unemployed are individuals unemployed for at least one year. (2) As regards benefits of active labour market policies, the following interruptions of unemployment are not considered within a five-year period: 1. periods in active labour market programmes, 2. periods of sickness or maternity leave, 3. periods used for child-rearing or care for dependants, 4. employment or self-employment up to a duration of six months, 5. periods during which employment was legally impossible, and 6. short interruptions without further evidence."

Work and Technology (IAT), was based on case studies from 10 local employment agencies and 84 telephone interviews with company representatives. It confirmed that the EGZ is regarded as an important instrument by employment agencies. Since there is no legal claim to the EGZ, and EGZ are funded from the local agencies' budgets available for all active labour market policies, there is substantial scope for decision-making concerning the allocation of the subsidy to a particular company for employment of a particular worker, the amount and the duration of benefits. This often leads to a process of barter between the employer and the employment agency depending, in particular, on previous experiences. In addition, some agencies use standardised subsidy packages to be paid if certain criteria are fulfilled. Others decide on the basis of the individual labour market disadvantages of the unemployed. Another criterion is the likely success (in terms of moving to unsubsidised employment after the expiry of the EGZ) of a worker offered employment by a company.

In the majority of cases, an initial contact between a worker and an employer already exists and the employment agencies react to the company's inquiries whether the employment of a particular worker can be subsidised. Frequently, the employer demands a minimum amount of subsidies required for hiring the worker. In other cases, the employment agency informs the unemployed workers about the possibility of subsidised hiring. Placement officers also approach companies and propose individual unemployed workers as job candidates, indicating a willingness to financially support their employment by means of the EGZ. However, employment agencies mostly give precedence to job candidates who can be employed without hiring subsidies. In very rare cases, the EGZ is also used to influence companies' location and investment decisions.

The issue of deadweight effects is particularly relevant if the worker and the company already know each other. It will often be difficult for placement officers to decide whether the company would, indeed, refrain from hiring the worker unless a subsidy is paid. Previous experience with the employer provides only an incomplete guideline. When companies were asked about their motives for claiming EGZ, they agreed that these subsidies mainly facilitate the employment of workers with uncertain chances of success on the job. Unsurprisingly, companies tended to downplay the relevance of deadweight effects. However, about half of the companies who had received EGZ in the past responded that their hiring behaviour had not been affected by the EGZ (ZEW, IAB and IAT, 2005: 140). Overall, the implementation study strongly confirms the notion that deadweight effects are a major issue in the allocation of German hiring subsidies.

3 The data

This evaluation is based on the Integrated Employment Biographies (IEB), a unique set of administrative data collected or provided by the German Federal Employment Agency. An overview is given by Wilke and Winterhager (2004), while detailed information on a random sample of the IEB is contained in Hummel et al. (2005). An application of the data to training programmes is documented in Bender et al. (2005). The database is also used in a number of other evaluation studies currently conducted to evaluate the Hartz reforms (Bundesregierung, 2006).

The IEB are composed of the following four separate data bases:

- The Employment Register (Beschäftigten-Historik, Beh) is composed of the compulsory reports of German companies on the beginning, change or end of all employment relationships to the public pension system. It contains information on employment episodes and remuneration. Different forms of employment, such as regular work, marginal employment or employment in vocational training schemes, can be distinguished in the data source. Furthermore, some worker characteristics such as sex, age, schooling and some employer characteristics such as industry are also contained in this data base. It is available with a time lag of about two years.

- The Benefit Claimants Register (Leistungsempfänger-Historik, Leh) unifies data on the receipt of unemployment benefit or (former) unemployment assistance and the subsistence allowance paid in cases of sickness.

- The Programme-Participants Comprehensive Data Base (Maßnahme-Teilnehmer-Gesamtdatenbank, MTG) provides information on participation in active labour market programmes, such as subsidised employment (including EGZ), training schemes, the bridging allowance for start-up companies by the unemployed, the programmes of the European Social Fund and other policy programmes. Availability of this information is important because subsidised employment or employment in active labour market programmes is coded in the same way as regular (primary) employment in the employment register. Data from the MTG is available from the year 2000.

- The Job Applicant Files (Bewerberangebotsdateien, BewA) is the most comprehensive data base on the characteristics of all registered job seekers.

All of the information contained in the data set is available at daily frequency. For our study, we had access to the complete set of data from these sources for individuals in the relevant age groups. From the age information and the date of entry into unem-

ployment, the data set of relevant employment, unemployment or non-employment spells is constructed.

Three different definitions of the outcome variable, employment subject to social security contributions, are considered:

1. Employment subject to social security contributions as contained in the BeH, without any further adjustments or corrections to the data.

2. Employment subject to social security contributions extended by cases in which the EGZ subsidy was paid. This outcome indicator corrects possible inconsistencies in the data. In principle, only employment subject to social security contributions can be subsidised by the EGZ. Hence, for each subsidy spell in the MTG there should be a corresponding employment spell in the BeH. We consider the information from the MTG as more accurate in cases of disagreement because it is known that employers sometimes report hirings to the pension insurance register belatedly.

3. Employment in the second definition, but excluding participation in active labour market programmes of other kinds, such as Employment Creation Schemes (Arbeitsbeschaffungsmaßnahmen, ABM), Structural Adjustment Measures (SAM), training programmes, etc. Individuals may be in subsidised employment as well as participate in other programmes. If participation in these programmes differs according to age groups, this may distort the outcome measure unless employment spells that coincide with programme participation are eliminated. Moreover, employment effects of hiring subsidies can only be isolated from spells that do not coincide with other programmes. For this reason, this definition of employment is used unless indicated otherwise.

The covariates used to reduce the variance of the results presented in section 5 are all drawn from the BewA. They relate to the family situation (single, married or living with a partner, or lone parent), the qualification of the worker, whether or not the person had experience in the job he or she applied for, etc. All variables enter as dummy variables. Their values are summarised in table 1 separately for the treatment and the control groups. With the exception of family situation, both groups of individuals do not exhibit substantial differences in composition.

4 Estimation approach and implementation

The object of the empirical analysis is to estimate the average treatment effect on the treated (ATT): the effect of being eligible to be subsidised by the Integration Supple-

ment on the chances of re-employment for persons eligible to be subsidised. As explained in section 2, a natural experiment design is chosen to identify the ATT. If treatment consists in legal eligibility for programme participation, the use of non-experimental approaches that aim at generating observationally identical treatment and control groups (such as the statistical matching) is hard to justify. The evaluation is based on a change in the eligibility criteria introduced in 2002, when the requirement that workers had to be long-term unemployed or unemployed within six of the preceding 12 months was dropped. The change in the outcome variable in a treatment group just above the age threshold is then compared to a control group of individuals just below the threshold. This means that the difference-in-differences effect is estimated.

A consequence of the research design is that the estimated effect will be a local average treatment effect (LATE, Imbens and Angrist, 1994). In other words, the effect is estimated only for those individuals that are brought into the programme because the programme design was changed (i.e., individuals unemployed for a period shorter than the original legal requirement). If treatment effects are believed to be heterogeneous, it is unclear whether the estimated effect carries over to other groups of eligible persons.

The difference-in-differences estimator is defined as follows:

$$\hat{\beta} = \frac{1}{N_{ht}} \sum_{i \in N_{ht}} y_i - \frac{1}{N_{hs}} \sum_{i \in N_{hs}} y_i - \left(\frac{1}{N_{kt}} \sum_{i \in N_{kt}} y_i - \frac{1}{N_{ks}} \sum_{i \in N_{ks}} y_i \right)$$
$$= \overline{y}_{ht} - \overline{y}_{hs} - \left(\overline{y}_{kt} - \overline{y}_{ks} \right) = \Delta \overline{y}_h - \Delta \overline{y}_k \tag{1}$$

where the outcome indicator (e.g., employment) is denoted as y. The indicator is measured at two different points of time, s and t, where $s < t$, with the policy change occurring between these two time periods. At time t we observe N_{ht} individuals in treatment and N_{kt} individuals in the control group. Notation for time s is analogous.

In implementing the estimator, the treatment and the control group and the observation periods s and t must be defined. In the following, the treatment group comprises workers aged 50 to 52 at the time of observation.[4] The control group consists of individuals aged 48 or 49 but otherwise satisfying the same criteria as the treatment group. Since individuals in long-term unemployment were always eligible to be hired into EGZ-subsidised employment, we track workers only over a period of up to six months since the start of the unemployment spell. Figure 2 graphically summarises this requirement. If, for instance, an individual entered unemployment on June

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4 Individuals whose 50th birthday was between the beginning of their unemployment spell and the date of observation fell in the observation period are in the treatment group from this date onwards, although they have not been exposed to the programme during the entire period.

1st, 2002, the outcome should be observed no later than December 1st of the same year.

Only individuals entering unemployment in June, 2002, are included in the data from the post-change period. Entries into unemployment in earlier months are not considered due to possible introduction effects: since the change in the policy may not have been sufficiently known among placement officers or employers, numbers from the initial periods after the policy change may give a distorted view of the overall effect. Entries into unemployment later than June 30th are not considered due to the start of a different labour market programme on January 1st, 2003 for the same group of unemployed (see below).[5]

The pre-change time period s is taken from the year 2000. This has the disadvantage that business cycle situation was less similar to 2002 in this year than in 2001. However, the choice of 2001 as the reference period would have meant that observations very close to the programme introduction would have had to be used. If workers, employers or placement officers anticipated the policy change on January 1st, 2002, this may have slowed exit from unemployment, leading to a spurious effect of the policy change in the observation period one month earlier (Ashenfelter's dip, see below).[6] The outcome variable is observed only once for each individual, on December 1st of 2000 and 2002, respectively. A sensitivity analysis with respect to the change of the observation date is conducted below.

The difference-in-differences effect may be represented equivalently as the coefficient of a dummy variable which interacts treatment status and time periods. The difference-in-differences effect may, therefore, be estimated by ordinary least squares. If, as in our case, the outcome y is binary, estimation techniques for discrete dependent variables such as the probit model may be used.

$$y_{i\tau} = \alpha_0 + \alpha_1 d_t + \alpha_2 d^h + \beta d_\tau^h + \varepsilon_{i\tau},$$ (2)

Here, the α's and β are the parameters to be estimated and ε_{it} is a statistical disturbance term. It is assumed that $E(\varepsilon_{i\tau} \mid d_\tau^h) = 0$. The coefficient α_1 contains the influence of time on the outcome indicator ($d_t = 1$ in period $\tau = t$ and $d_t = 0$ in period $\tau = s$). Time-constant differences between the treatment and the control group are measured by the coefficient α_2 ($d^h = 1$ iff $i \in h$, where h indicates treatment status). The

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5   The sensitivity of the results with respect to an extension of the inflow period will be examined in future stages of the project.

6   To avoid the influence of seasonal effects in exit from unemployment, measurement of the outcome variable takes place in the same months in both the pre-change and the post-change periods.

coefficient β for the interaction term d_τ^h ($d_\tau^h = 1$ iff $i \in h$ and $\tau = t$) measures the causal effect of the programme on the outcome indicator.

Equation (2) may be extended to account for the influence of additional observable covariates:

$$y_{i\tau} = \alpha_0 + \alpha_1 d_t + \alpha_2 d^h + \beta d_\tau^h + \delta' z_{i\tau}^J + \varepsilon_{i\tau} \ . \tag{3}$$

Here, $z_{i\tau}^J$ is a vector of control variables and δ is a vector of parameters to be estimated. Based on the estimated employment effect, the deadweight effect is calculated as the difference between additional subsidies disbursed and additional employment created in the newly treated group. The closer these numbers are, the lower is the deadweight effect. The estimator of the displacement effect can be based either on the unconditional or the conditional version of the difference-in-differences estimator.

The most important assumption underlying the difference-in-differences estimator is the condition that $E(\varepsilon_{i\tau} \mid d_\tau^h) = 0$. This condition is tantamount to assuming that the value of y is the same between the two groups in the absence of treatment. It is, therefore, important that there remain no further reasons why the changes in the outcome indicator should be different between the treatment and the control group (Meyer, 1995b). There are a number of reasons why this assumption may be violated, three of which deserve specific discussion.

Other programmes concerning treatment or control group

If other policy programmes change between the observation date and if control and treatment groups are affected differently by these changes, the effect of the EGZ cannot be separated from the effect of these other programmes. It is, therefore, important to check whether programmes were introduced or changed within the time period considered.

There were no changes to the German Social Code, Volume III, with an explicit age threshold of 50 years between 2000 and 2002. As mentioned above, a change did occur with the introduction of the Income Safeguarding Programme (Entgeltsicherung, Egs) taking effect, however, only from January 1st, 2003. This programme applies to all workers aged 50 or above, i.e., the age limit is the same as for the hiring subsidies considered here. In order to avoid confusion of the effects of the different programmes, the outcome indicator is considered only until December, 2002.

Regarding other changes in policies affecting older workers or older unemployed, both the age threshold and the introduction date differ from the change to the EGZ subsidy. For instance, the threshold for the unlimited applicability of fixed-term contracts was lowered from 58 to 52 years on January 1st, 2003. The exemption from

employer contribution to compulsory unemployment insurance (Beitragsbonus) affected workers aged 55 and above only from January 1st, 2004. Therefore, programme multiplicity does not seem to be an issue for our study.

Other influences on particular age groups

The labour market situation may evolve differently for different age groups. For instance, employers may be more hesitant to hire older workers as compared to younger workers in times of economic improvement because employment protection is often stricter for older workers. For this reason, the periods of comparison should be similar in terms of business climate. Moreover, age groups should not be too distant, and, in particular, they should not be affected differently by policy programmes. In our case, workers in the control group are aged 48 or 49, while workers in the treatment group are aged 50 to 52. Although employment protection is generally stricter for older than for younger workers (age being one criterion used in unjust-dismissal litigation and for social selection in cases of redundancies in Germany), there is no specific age threshold and, therefore, it is unlikely that the two groups are regarded as different in this respect by employers.

Anticipation effects

The phenomenon that the outcome variable (such as exit from unemployment) measuring the success of the programme drops shortly before the onset of treatment due to the anticipation of treatment is known as Ashenfelter's dip (Ashenfelter, 1978). In our case, this phenomenon may occur if companies stopped hiring workers above 50 some time before January 1st, 2002, in the expectation that these workers could be employed on a subsidised contract after that date. For the same reason, the unemployed may have stopped search activities before that date. Hence, the hiring rate may be particularly low immediately before the change and higher after the change due to anticipation effects. Hence, if the periods of measurement are sufficiently close to the date of change, the results of the difference-in-differences procedure may be distorted.

We avoid Ashenfelter's dip concerning the date of introduction of the changes by choosing observation dates sufficiently far from the policy change to render anticipation effects unlikely. There is another anticipation effect concerning the eligibility to subsidised hiring after six months of unemployment in the period before the policy change. Employers may have been reluctant to hire workers shortly before the start of eligibility. This may result in a low exit rate before the policy change in the group of workers aged 50 to 52 and, therefore, to a spurious difference-in-differences effect. To check for this possibility, earlier observation dates (four and five months after the entry into unemployment) are chosen in alternative sets of estimates (see Bergemann et al., 2000, for a similar approach).

5 Results

Before the employment effects of the change in eligibility conditions are explored, we first track the effects on the number of subsidised employment relationships in the data. Had the number of disbursed subsidies remained unchanged, any changes in employment could not be attributed to the legal change. Table 2 shows, however, that the change in admission criteria resulted in a highly significant increase in the number of workers supported in the treatment group. The table contains the share of individuals in EGZ subsidised employment for each of the four subgroups (treatment and control group, before and after the natural experiment). Numbers refer to all EGZ subsidies, whether specifically designed for older workers or for other labour market groups. From the EGZ shares, the unconditional difference-in-differences effect can be calculated. The t-statistics displayed in the lower half of the table are taken from the estimation of equation (2), with a dummy variable indicating employment in December 2000 or 2002 as the dependent variable, either by OLS or by probit.

There is a marked increase in subsidised employment after the widening of the eligibility criteria in the age group above 50 years. By contrast, the share of workers in subsidised employment in the control group actually declined despite of the overall expansion of the EGZ programme between the two points of time (see figure 1). Hence, EGZ subsidies seem to have been concentrated on newly eligible workers.

Table 3 shows the proportion of individuals working (in the third definition given in section 3) in each of the subgroups. The figures imply that between 14 and 17 per cent of all workers entering an unemployment spell in June 2000 or 2002 were observed in employment in the following December. In both groups, a decline in the employment share can be observed between the two observation dates. This can be explained by the worsening of labour market conditions in this period.[7] There are, however, striking differences between the treatment and the control group in the degree to which a decline has taken place. The difference-in-differences measure effect suggests a strongly positive employment effect which is significant at the one per cent level.

These results do not control for the composition of the groups, which may differ between groups and over time. Conditional DD results are contained in table 4. These results are taken from a linear probability model to facilitate comparison with the unconditional effects. Probit estimation did not yield qualitatively different results. The first column shows regression results for all individuals in the data set, while the results in the other columns are taken from regressions for population sub-groups. The

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7   For instance, the official unemployment rate increased from 9.3 to 10.1 per cent between December 2000 and December 2002.

difference-in-differences effect is the coefficient for the interaction term between time and treatment status according to equation (3).

For the whole data set, the effect is again positive and significant. The magnitude of the effect is even slightly higher than the unconditional estimate. It implies that the employment share six months after entry into unemployment increased by two percentage points in the treatment group relative to the control group after the expansion of the eligibility criteria for the EGZ. The following four columns show evident differences in the magnitude and statistical significance of the policy effect. In West Germany, the treatment effect is positive but insignificantly different from zero for both male und female workers, while it is significant for men and, in particular, for women in the East. Moreover, the effect has twice the size in East Germany, where about three per cent of all unemployed workers have found employment due to the expansion of the EGZ programme.

The coefficients of the control variables influence employment similarly as in other studies (Fitzenberger and Wilke, 2004; Caliendo et al., 2005). Individuals living together as couples as well as lone parents have a higher likelihood of being observed in employment than singles. Children in the household, on the other hand, reduce the likelihood of employment. Foreign nationals and women have worse chances of finding employment than German males. Skilled workers or graduates from higher education are far more likely to exit unemployment to a new job than unskilled workers.

Next, table 5 shows the number of additional subsidies disbursed and contrast it with the number of additional employment relationships. Both of these are calculated from a regression analogous to the one displayed in table 4; the regression for EGZ subsidies is omitted. The predicted numbers are derived as the coefficient of the interaction term multiplied by the number of observations in the treatment group in December 2002.

As the last row of the table indicates, the point estimate for additional employment is roughly of the same order of magnitude as the estimated number of additional EGZ subsidies. This means that in the treatment group, one additional job is created for each subsidy disbursed. This implies a low level of deadweight effects. However, the confidence interval for both numbers is large; at the lower bound of the confidence interval, only 25 additional jobs are created. However, the null hypothesis that all subsidies are neutralised by deadweight effects can be rejected at all conventional confidence levels. In the four population groups, the estimated employment effects sometimes even exceed the estimated number of additional subsidies. This result is not totally unreasonable, because some EGZ subsidies may have expired (or individuals have changed jobs to unsubsidised employment) before the observation date. More

likely, however, the difference between the two point estimates is explained by their relatively high variances.

The last two tables present results for two sensitivity checks. The first concerns different definitions of the employment variable. Table 6 shows the coefficients of the interaction terms in a regression as displayed in table 4; the last column reproduces the result from that table. In the regressions shown in first two columns, the dependent variable is employment in the other two definitions. Comparing the first definition with the one used in the rest of this paper, we see that the magnitude of the effect is only half the size of the coefficient reported in table 4, and the coefficient is significant only at the ten per cent level. This indicates that the results depend crucially on the definition of labour market status. The middle column shows that the discrepancy between the two results is due to the neglect of spells that were not reported as regular employment spells by the employer but were subsidised by the employment agency. For the reasons given in section 3, we prefer the third definition of employment.

The second sensitivity check addresses the possibility of Ashenfelter's dip shortly before programme eligibility sets in when unemployment duration approaches six months. Hiring could be decreased in the treatment group in 2000 at this time, giving rise to an overestimate of the difference-in-differences treatment effect. The first two columns display the results when the outcome variable is observed on October 1st or November 1st, respectively. Again, the last column reproduces the results from table 4.

As the results show, the magnitude of the effect decreases if the outcome variable is measured one or two months earlier. This could indicate that the results for December are biased due to the presence of Ashenfelter's dip. However, an alternative explanation is that individuals gradually transit from unemployment to subsidised employment. If the employment effect of hiring subsidies unfolds slowly over time, the effect of extending eligibility will be the higher the longer the time period during which individuals are exposed to potential participation. The table also shows, however, that the difference in the magnitude of the effect remains moderate, and even the treatment effect after four months is clearly significantly different from zero.

6 Conclusions

In this study, we have used a natural experiment design to answer the question whether hiring subsidy programmes lead to earlier exit from unemployment to employment in the group of eligible persons as compared to the situation in which no subsidies are available. We have used a change in the eligibility criteria which extended potential programme participation to older workers unemployed for less than six months. Using

the difference-in-differences estimator, we have compared the change in the likelihood of employment six months after the entry into unemployment to a control group of workers just below the age of eligibility. The results show that eligibility increased the likelihood of exiting unemployment by about two percentage points. Due to Ashenfelter's dip, however, this effect could be over-estimated by about 50 per cent.

The results from an implementation study strongly suggest the presence of deadweight effects. To estimate deadweight effects, we have compared the number of additional employment relationships to the number of additional subsidies disbursed. The point estimates for both numbers suggests that the EGZ is highly effective in the group of treated individuals. Before policy conclusions can be drawn, however, it must be remembered that these number stem from point estimates with relatively large confidence intervals. For some groups of workers, the null hypothesis of no additional employment cannot be rejected.

Clearly, these results constitute only a first step towards a comprehensive evaluation of hiring subsidies. There remains the question of the persistence of the employment relationships that were initially subsidised. A major difficulty here is to form a suitable control group for programme participants. These issues are discussed in chapter 5 of ZEW, IAB and IAT (2005). Moreover, it is quite possible that additional employment merely substitutes for employment cuts in other population groups. Since the absence of these substitution or displacement effects cannot be ascertained in a microeconometric study of individual workers, analyses at the firm or the regional level remain useful complements.

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Figure 1: Employment contracts subsidised by Integration Supplements

Source: Federal Employment Agency,

http://www.pub.arbeitsamt.de/hst/services/statistik/detail/f.html
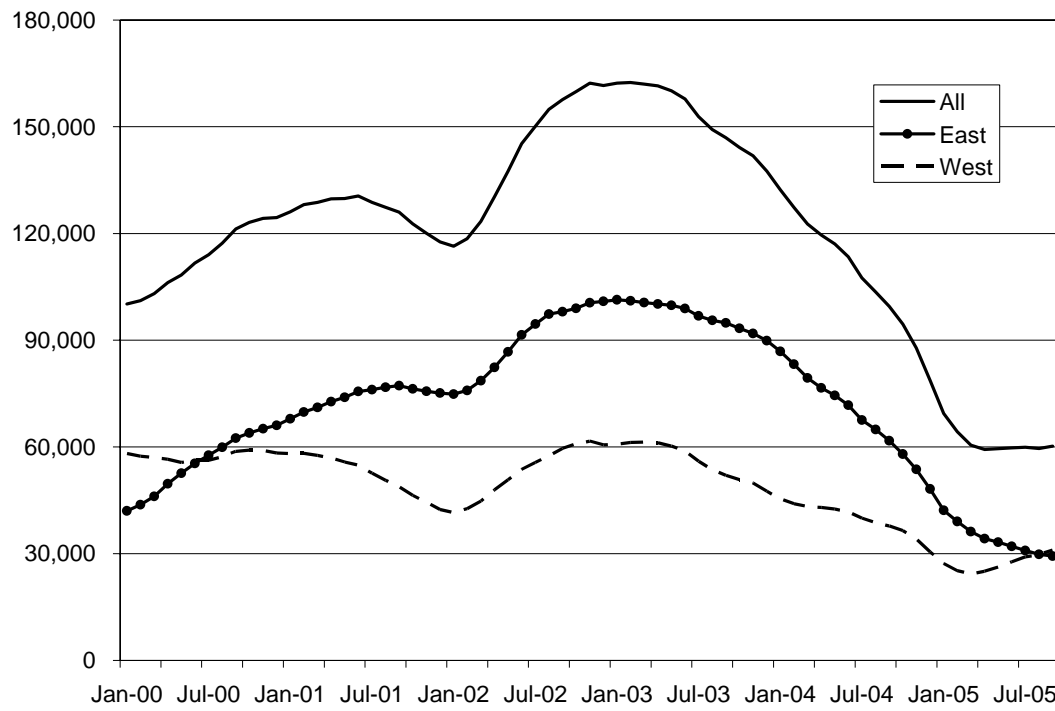
Figure 2: Time schedule for the difference-in-differences analysis
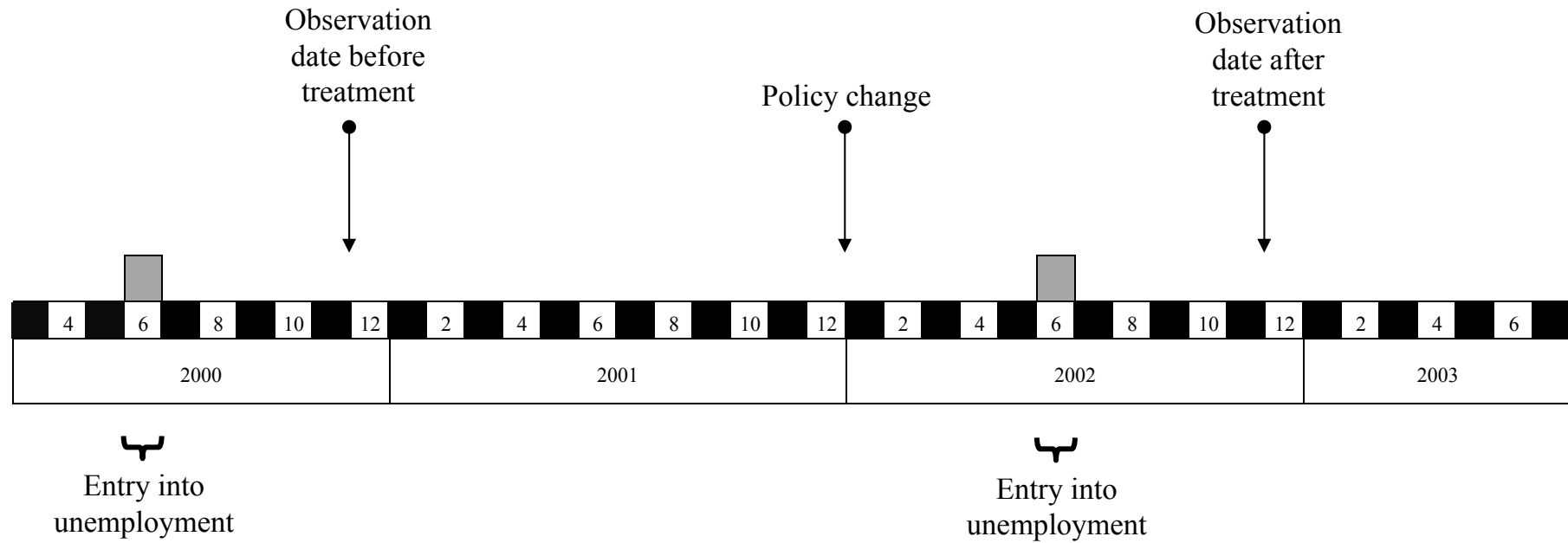
Table 1: Descriptive statistics for the independent variables

Variable	Age 48 and 49	Age 50 to 52
Married / living together	0.686	0.708
Lone parent	0.034	0.021
Single	0.279	0.269
Job experience	0.903	0.910
Unskilled worker	0.468	0.459
Skilled worker	0.437	0.448
Technical school degree	0.030	0.034
Technical college degree	0.025	0.023
University degree	0.040	0.036
One child living in household	0.182	0.141
Two children living in household	0.079	0.054
Three or more children living in household	0.036	0.025
Female	0.471	0.481
Foreign national	0.079	0.090

Note: All variables are defined as dummy variables.

Table 2: Proportion working in EGZ-subsidised employment

	2000	2002	Unconditional Difference
Treatment Group	2.07	3.46	1.39
(Age 50 to 52)	(22652)	(27267)	
Control Group	1.38	1.08	-0.30
(Age 48 and 49)	(11079)	(12828)	
DD Effect			1.69
t-stat linear			8.26
t-stat probit			6.22

Note: Number of individuals in parentheses, t-statistics estimated robustly.

Table 3: Estimated employment effects of EGZ subsidy for older workers

	2000	2002	Unconditional Difference
Treatment Group	15.33	14.44	-0.89
(Age 50 to 52)	(22652)	(27267)	
Control Group	16.38	13.92	-2.46
(Age 48 and 49)	(11079)	(12828)	
DD Effect			1.57
t-stat linear			2.78
t-stat probit			2.76

Note: Number of individuals in parentheses, t-statistics estimated robustly.

Table 4: Results for the linear probability model, dependent variable: employment

	All workers	Men West	Men East	Women West	Women East
After treatment (2002)	-0.027	-0.041	-0.022	-0.028	0.003
	(5.55)	(5.06)	(1.84)	(3.21)	(0.23)
Treatment group (Aged 50 to 52)	-0.016	-0.007	-0.023	-0.020	-0.027
	(3.56)	(0.86)	(2.06)	(2.52)	(2.94)
DD term	0.020	0.015	0.029	0.014	0.034
	(3.44)	(1.56)	(1.99)	(1.34)	(2.63)
Married / living together [b]	0.044	0.066	0.091	0.001	0.036
	(14.11)	(12.51)	(11.66)	(0.10)	(4.79)
Lone parent [b]	0.058	0.041	-0.012	0.041	0.047
	(6.00)	(1.58)	(0.40)	(2.87)	(2.75)
Job experience	0.023	0.020	0.041	0.021	0.022
	(5.29)	(2.68)	(3.36)	(2.83)	(2.12)
University degree [b]	0.068	0.045	0.071	0.093	0.090
	(8.49)	(3.62)	(4.07)	(5.88)	(4.14)
Technical college degree [b]	0.039	0.035	0.106	0.016	-0.002
	(4.23)	(2.39)	(5.02)	(0.81)	(0.12)
Technical school degree [b]	0.062	0.069	0.095	0.016	0.065
	(7.35)	(5.23)	(5.46)	(0.77)	(3.38)
Skilled worker [b]	0.044	0.039	0.082	0.042	0.035
	(15.49)	(7.85)	(11.34)	(8.05)	(5.87)
One child [c]	-0.007	-0.000	-0.015	-0.001	-0.033
	(1.79)	(0.06)	(1.47)	(0.10)	(4.06)
Two children [c]	-0.002	-0.001	-0.038	0.024	-0.059
	(0.40)	(0.06)	(2.57)	(2.12)	(4.59)
Three or more children [c]	-0.035	-0.041	-0.070	-0.003	-0.078
	(4.55)	(3.81)	(3.15)	(0.18)	(4.34)
Foreign national	-0.019	-0.014	-0.062	-0.041	-0.056
	(4.15)	(1.99)	(2.48)	(6.13)	(2.51)
Female	-0.024	-	-	-	-
	(8.71)	-	-	-	-
Constant	0.106	0.098	0.038	0.140	0.055
	(17.80)	(10.13)	(2.46)	(13.24)	(3.94)
Number of obs.	70699	24763	12087	22270	11579
R^2	0.010	0.014	0.025	0.009	0.012

[a] Left-out category: single; [b] Left-out category: single unskilled workers; [c] Left-out category: no children living in household, t-statistics (in parentheses) estimated robustly

Table 5: Comparison of subsidies disbursed and employment changes

	Number of EGZ for older workers disbursed	Predicted employment change
Men West	117	170
Men East	188	134
Women West	68	121
Women East	82	147
All workers	471	546

Note: Predicted employment and predicted subsidies based on conditional DD estimate.

Table 6: Employment effects by definition of employment variable

	Definition 1	Definition 2	Definition 3
Interaction term	0.011	0.017	0.020
t-stat linear	1.83	2.71	3.44
t-stat probit	1.80	2.75	3.41
Number of observations	70699	70699	70699
R^2	0.013	0.014	0.010

Note: Interaction terms based on a regression model as in table 4.

Table 7: Employment effects by observation date

	October	November	December
Interaction term	0.013	0.017	0.020
t-stat linear	2.32	2.94	3.44
t-stat probit	2.25	2.84	3.41
Number of observations	70695	70697	70699
R^2	0.009	0.011	0.010

Note: Interaction terms based on a regression model as in table 4.