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Wage subsidies for needy job-seekers and their effect on individual labour market outcomes after the German reforms

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Wage subsidies for needy job-seekers and their effect on individual labour market outcomes after the German reforms

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Hermann Gartner
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Mit der Reihe „IAB-Discussion Paper“ will das Forschungsinstitut der Bundesagentur für Arbeit den Dialog mit der externen Wissenschaft intensivieren. Durch die rasche Verbreitung von Forschungsergebnissen über das Internet soll noch vor Drucklegung Kritik angeregt und Qualität gesichert werden.

The “IAB Discussion Paper” is published by the research institute of the German Federal Employment Agency in order to intensify the dialogue with the scientific community. The prompt publication of the latest research results via the internet intends to stimulate criticism and to ensure research quality at an early stage before printing.

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Abstract

In Germany, since 2005 needy job-seekers without access to earnings-related and insurance-paid “unemployment benefit I” are entitled to means-tested and tax-funded “unemployment benefit II”. Several active labour market programmes support the integration of these needy job-seekers into the labour market. Our paper estimates the average effect of targeted wage subsidies – paid to employers for a limited period of time - on the subsequent labour market prospects of participating needy job-seekers. We apply propensity score matching to compare participants with a group of similar non-participants. The results show that wage subsidies had in fact large and significant favourable effects: 20 months after taking up a subsidised job, the share of persons in regular employment is nearly 40 percentage points higher across participants. Estimated effects on the shares not unemployed and the share no longer receiving “unemployment benefit II” are slightly smaller.

Zusammenfassung

Seit dem Jahr 2005 erhalten erwerbsfähige Hilfebedürftige, die keinen Anspruch auf das beitragsfinanzierte Arbeitslosengeld I haben, das steuerfinanzierte Arbeitslosengeld II. Verschiedene Maßnahmen aktiver Arbeitsmarktpolitik sollen den Übergang der erwerbsfähigen Hilfebedürftigen in Beschäftigung unterstützen. Dieser Beitrag untersucht die durchschnittliche Wirkung von Eingliederungszuschüssen auf die Arbeitsmarktchancen der teilnehmenden erwerbsfähigen Hilfebedürftigen. Mit Hilfe von Propensity-Score-Matching wird eine Vergleichsgruppe von ähnlichen Nicht-Teilnehmern gebildet. Die Ergebnisse zeigen, dass Eingliederungszuschüsse die Arbeitsmarktchancen der Geförderten positiv beeinflussen: 20 Monate, nachdem erwerbsfähige Hilfebedürftige eine geförderte Beschäftigung aufgenommen haben, ist ihr Anteil in regulärer Beschäftigung um ca. 40 Prozentpunkte höher als in der Vergleichsgruppe. Die geschätzten Effekte auf die Variablen „nicht arbeitslos“ und „kein Arbeitslosengeld-II-Bezug“ fallen etwas geringer aus.

JEL classification: J68, J64, J65

Keywords: Wage subsidies, unemployment benefits II for needy job-seekers, evaluation of active labour market programmes, propensity score matching

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1 Introduction

Due to high and increasing unemployment rates at the beginning of the millennium, the German federal government has been initiating fundamental labour market reforms: Since 2003 the German Public Employment Service was reorganised, the design of several active labour market programmes was modified and new programmes were introduced. At the beginning of 2005, the former unemployment assistance for long-term unemployed persons and the former social assistance were merged into the new "unemployment benefit II" – a means-tested and tax-financed basic income support for employable needy job-seekers. Finally, since 2006, the duration of earnings-related and insurance-financed "unemployment benefits I" has been shortened.

Several active labour market programmes – established ones as well as newly introduced ones – support the integration of employable needy job-seekers into the labour market. Targeted wage subsidies, paid to employers for a limited period of time, are one of the programmes that have been established already before the recent reforms. First, they reduce labour costs and can compensate the firm for a temporary gap between a worker's wage and his or her productivity. Second, a period of subsidisation might help previous unemployed persons to disclose their productivity to an employer and might thus serve as a screening advice. In a recent paper, Neumark (2008) concludes that such wage subsidies might be a policy worth considering, if one strives to improve economic self-sufficiency via increasing earnings.

Our paper estimates the effect of these targeted wage subsidies on the subsequent labour market prospects of treated needy job-seekers, who receive unemployment benefits II. The effectiveness of the instrument in the pre-reform period has been investigated by Bernhard et al. (2006) and Jaenichen/Stephan (2007), who found rather large positive effects of the subsidy. However, the group of unemployment benefit II recipients exists as such only since 2005 and is very heterogeneous (Koch/Walwei 2008). In particular, its exit rate into regular work is comparatively low (Bach et al. 2008, 6). Thus it is not obvious ex-ante that previous results on the effectiveness of wage subsidies will be valid for this group also.

In particular, we ask whether taking up a subsidised job between February and April 2005 had an impact on the percentage of participants who were a) in unsubsidised employment, b) not unemployed and c) not receiving unemployment benefit II during the subsequent months. We apply statistical matching techniques and estimate programme effects by comparing participants with a group of similar needy job-seekers, who did not enter a subsidised job between February and April 2005. In short, our results confirm previous positive findings.

In Section 2 we will sketch the institutional background and characterise the analysed programme. Furthermore, we will briefly describe international evidence on the effectiveness of wage subsidy programmes. Section 3 discusses the evaluation

strategy, while Section 4 introduces data and variables as well as the applied method. The empirical results are depicted in Section 5. We draw some conclusions in Section 6.

2 Institutional background and literature review

Institutional background and programme features

A major part of the social reforms initiated in Germany during the years 2002 and 2003 involved the system of unemployment compensation. Unemployed persons who had contributed to the German unemployment insurance system are eligible for unemployment benefits I (*Arbeitslosengeld I*), which amounts to as much as 67 percent of the latest net income and is paid for a limited period of time. The legal basis for the unemployment insurance system is the Social Code III (*Sozialgesetzbuch III*). Traditionally, the German Public Employment Service has been responsible for the administration of the unemployment insurance as well as for the job placement and programme assignment of registered unemployed persons.

When unemployment benefits were exhausted, former unemployment benefit recipients were supported prior to 2005 by means-tested and tax-financed unemployment assistance (*Arbeitslosenhilfe*), where the amount was also conditional on former income. Needy persons without claims for unemployment insurance or unemployment assistance could apply for means-tested social assistance (*Sozialhilfe*), which was administered by municipalities. Even if capable of work, many of these needy persons were not registered as unemployed at the Public Employment Service.

With the beginning of 2005 the Social Code II (*Sozialgesetzbuch II*) came into force: Former unemployment assistance was abolished. Now needy unemployed job-seekers and their household members are entitled to means-tested and tax-financed unemployment benefit II (*Arbeitslosengeld II*). Its amount does not depend on former income. Note that needy job-seekers and their household members are predominately registered as unemployed and may receive employment services.

Since 2005, the administration of the new services for needy job-seekers is mostly conducted jointly by the Public Employment Service and by municipalities. An exception was made for 69 municipalities who opted out of this cooperation and provide all services for needy job-seekers on their own (*Optierende Kommunen*). Public Employment Services are now organised in two branches: (1) a tax-funded branch - based on the Social Code II - for needy employable job-seekers and their households and (2) an insurance-funded branch - based on the Social Code III - for job-seekers who receive unemployment benefits I or have not yet qualified for unemployment benefits I. Konle-Seidl (2008) and Stephan/Zickert (2008) discuss aspects of the new governance of employment services.

In Germany, several active labour market programmes support the integration of unemployed persons into the labour market. A comprehensive overview on these programmes and recent evaluation results can be found in Bernhard et al. (2008).

For the period 2000 to 2006, Table 1 shows entries and average numbers of participants in the most important programmes, which were in 2005 extended to recipients of unemployment benefit II respectively introduced in particular for this group. The most important programmes covered by Social Code II since 2005 are certainly public job creation schemes (Hohmeyer/Wolff 2007) and short-term training (Wolff/Jozwiak 2007). Contracting-out placement services to private providers (Bernhard/Wolff 2008), further vocational training and targeted wage subsidies are less often used, but are still important instruments. During the first half of 2005, nearly one percent of the average number of needy job-seekers took up a subsidised job (Heinemann et al. 2006). Start-up subsidies are granted to unemployment benefit II recipients only through a newly installed small-scale programme (Wolff/Nivorozhkin 2008).

Table 1
Entries and average numbers in selected labour market programmes during 2000-2006 (in 1000)

	2000	2001	2002	2003	2004	2005*		2006*	
						II/III	II	II/III	II
Entries into programme									
Wage subsidy (*Eingliederungszuschüsse*)	152	127	188	183	157	134	*51*	217	*97*
Further vocational training (*Förderung berufl. Weiterbildung*)	523	442	455	255	185	132	*66*	247	*103*
Public job creation I (*Arbeitsbeschaffungsmaßnahmen, SAM*)	318	246	215	179	161	80	*62*	80	*62*
Public job creation II (*Arbeitsgelegenheiten*)	-	-	-	-	-	630	*630*	742	*742*
Short-term training (*Trainingsmaßnahmen*)	485	551	865	1064	1188	894	*410*	978	*444*
Contracting-out placement services (*Beauftragung Dritter*)**	-	-	-	-	635	426	*273*	301	*148*
Average number in programme									
Wage subsidy (*Eingliederungszuschüsse*)	105	118	136	153	110	60	*21*	82	*68*
Further vocational training (*Förderung berufl. Weiterbildung*)	343	352	340	260	184	114	*18*	119	*47*
Public job creation I (*Arbeitsbeschaffungsmaßnahmen, SAM*)	266	237	193	144	117	61	*12*	50	*7*
Public job creation II (*Arbeitsgelegenheiten*)	-	-	-	-	-	201	*201*	293	*293*
Short-term training (*Trainingsmaßnahmen*)	52	60	74	93	95	69	*34*	70	*35*
Contracting-out placement services (*Beauftragung Dritter*)**	-	-	-	-	95	103	*75*	100	*76*

*) II/III = Programmes covered by Social Code II (without municipalities opting out of the co-operation with the Public Employment Service) and Social Code III; II = Programmes covered by Social Code II.

**) Figures are available since 2004, while different variants started already in 1998 (contracting-out subtasks of placement) respectively 2002 (contracting-out all placement services).

Source: Statistics Department of the German Public Employment Service (Data-Warehouse).

The decision to support an unemployed person with a targeted wage subsidy (*Eingliederungszuschuss*) lays in the discretion of the caseworker, who has – within the legal framework and guidelines of the local Employment Agency – also latitude in determining the amount and duration of the subsidy. The wage subsidy could at the most account for as much as 50 percent of the monthly wage or salary and continue for at most 12 months. Extensions might be granted for handicapped or older workers.

The employer is obliged to employ subsidised persons who are younger than 50 years for a follow-up period of further employment after the expiration of the subsidy (this period is usually as long as the period of subsidisation itself). If he dismisses the worker within this period for reasons not attributable to the worker, the employer may be asked to reimburse part of the subsidy.

Since the German labour market reforms, targeted wage subsidies has been granted for unemployment benefit I recipients covered by Social Code III as well as for needy job-seekers – receiving unemployment benefits II – covered by Social Code II. Thus, it has been suspected that currently caseworkers for different groups of unemployed persons may find themselves in "subsidisation competition" to secure jobs for their clients. This is a problem inherent in the current organisation of active labour market policies in Germany. A more integrated approach in supporting unemployed persons across the "legal boundaries" of the Social Code II and III would surely help to avoid this competition.

Brief literature review

For Germany, wage subsidies have been analysed comprehensively as part of the so called "Hartz-evaluation" of active labour market programmes (ZEW et al. 2005, 2006). As part of these studies, Bernhard et al. (2006) and Jaenichen/Stephan (2007) estimated average treatment effects of a subsidy on previously unemployed individuals, using statistical matching techniques. They showed that taking up a subsidised job during the second quarter of 2002 had significant and favourable effects on subsequent employment prospects of participants, compared to no or a later participation. Jaenichen (2002, 2005) found similar positive results for subsidised unemployed persons in 1999. While the comparison group in the cited studies were unsubsidised unemployed persons, Jaenichen/Stephan (2007) conduct also a comparison with individuals moving directly out of unemployment into unsubsidised employment. The results indicate that differences in the employment prospects between persons taking-up subsidised and unsubsidised jobs were rather small after three years.

The positive results are in line with the international literature on wage subsidies. For Sweden, Sianesi (2008), Carling/Richardson (2004), Fredriksson/Johansson (2004) and Forslund et al. (2004) investigated the effects of wage subsidies on the labour market prospects of previous unemployed participants. Regardless of the method used (statistical matching, event history analysis, instrumental variable difference-in-difference techniques) the results suggested positive effects of the programmes. Dorsett (2006) evaluated the British "New Deal" reform for young workers and showed that in the longer run the option to claim a wage subsidy dominated all other options in preventing unemployment.

For Belgium, Göbel (2007) applied a multivariate duration model with unobserved heterogeneity. He finds that participation in subsidised employment significantly shortens the duration until entry into unsubsidised employment. Furthermore, it significantly increases the duration of the first employment spell, but has no significant effects on the duration of later unemployment periods. Also for Belgium, Cockx et al. (1998) estimated duration models to analyse the effect of temporary wage subsidies on job tenure; they found positive, but insignificant effects. Similarly, Hamersma (2005) obtained insignificant effects of a subsidy on job tenure for the State of Wisconsin, using statistical matching techniques.

Summing up, most studies find that taking up a subsidised job has positive effects on subsequent employment prospects of previous unemployed participants. However, some effects cannot be identified by the research designs underlying the studies mentioned above (Calmfors 1994). First, a deadweight loss occurs, if several of those subsidised would have been recruited also without help of a subsidy. The underlying reason might be imperfect information on the side of the caseworker as well as collusion between the public employment office and the employer. Studies relying on a statistical matching approach might interpret the share of comparison group members that found a job without the help of a subsidy as an indicator for the size of deadweight losses. Second, substitution effects prevail, if some of those taking up a subsidised job will merely replace other workers. Third, displacement effects may arise if employment in some firms increases as a consequence of subsidisation, but at the expense of jobs in other firms, such that the only effect is displacement.

Also as part of the German "Hartz-evaluation" Boockmann et al. (2007) analysed the effect of changes in the legislation on wage subsidies for elder workers on the employment prospects of this group, thus taking advantage of a "natural experiment". They used a difference-in-differences estimator to compare changes in transition probabilities between the affected group and a comparison group comprised of slightly younger workers. The authors found nearly no significant effects and concluded that deadweight effects – those subsidised would have been hired anyway – are a major problem of wage subsidies. However, only a comparatively small percentage of individuals in the analysed age groups actually received the subsidy. Moreover, underlying changes in legislation affected the maximum duration of the subsidy, whereas the actual mean duration of the subsidy decreased over time (Bernhard et al. 2007).

3 Evaluation approach

We are interested in the mean effect of taking up subsidised employment between February and April 2005 on the labour market outcomes of participants. To determine this effect we have to estimate the counterfactual outcomes of participants in the absence of a subsidy. Any attempt to estimate these counterfactuals has, however, to take into account that subsidised workers are not selected randomly from the group of unemployed persons. In the absence of an experimental design one usually strives to find a very similar group of non-participating individuals, whose outcomes can be interpreted as counterfactual outcomes of the group of participants (Rubin 1974, Heckman et al. 1999).

We will sketch the underlying idea briefly: In month t+h after programme entry in t every person is assumed to have two potential labour market outcomes: Y_1^{t+h} is the potential outcome if a person has taken up a subsidised job during February to April 2005, while Y_0^{t+h} is the potential outcome in the case of non-participation. Participation in the programme is indicated by $D^t = 1$, non-participation by $D^t = 0$. To estimate the mean effect of taking up subsidised employment on the labour market prospects of participants, we assume that the participation of a person in the programme does

not affect the potential outcomes of any other person (Stable Unit Treatment Value Assumption). The so called average treatment effect on the treated (ATT) is given by the expected difference in an individual's two potential outcomes in t+h:

$$(1) \quad ATT^{t+h} = E[Y_1^{t+h} - Y_0^{t+h} \mid D^t = 1]$$

$$= E[Y_1^{t+h} \mid D^t = 1] - E[Y_0^{t+h} \mid D^t = 1].$$

The first term on the right-hand side $E[Y_1^{t+h} \mid D^t = 1]$ is just the mean of the observed outcomes of participants. However, to estimate potential outcomes of participants in the case of non-participation $E[Y_1^{t+h} \mid D^t = 0]$ we have to take into account that participants have at least managed to get a subsidised job, which implies that they have probably better labour market prospects than the average unemployed person.

Statistical matching techniques provide a solution for this problem that relies on the Conditional Independence Assumption (Rosenbaum/Rubin 1983). We assume that the outcome in the case of non-participation does not differ between participants and non-participants, when both groups are identical in regard of a number of observable characteristics, summarised in the vector X. This is formally expressed as $Y_0^{t+h} \perp D^t \mid X$, where $\perp$ denotes statistical independence. The assumption is satisfied if X contains all variables that jointly influence selection into the programme as well as post-programme outcomes. An estimator for (1) is then given by

$$(2) \quad ATT^{t+h} = E_X\{E[Y_1^{t+h} \mid X, D^t = 1] - E[Y_0^{t+h} \mid X, D^t = 0] \mid D^t = 1\}.$$

We are thus basing the choice of our comparison group on a comprehensive number of variables, which will be described in detail in Section 4. The estimate is valid, however, only if there are in fact non-participants with characteristics similar to those of participants; the treated have to be within "Common Support" of the comparison group (Heckman et al. 1999).

An important topic is the choice of the classification window in time, which defines which unemployed persons are classified as non-participating in a labour market programme. Sianesi (2004) and Fredriksson/Johansson (2004) have pointed out that labour market programmes in Europe are ongoing and any unemployed is a potential participant at any point of time. Individuals may take up a subsidised job sooner or later provided they are still eligible. But the unemployed themselves or the caseworker may decide against taking part in the wage subsidy programme, because they expect or are expected to find an unsubsidised job soon. Thus selecting a comparison group of individuals who never participated in any programme would base selection on expected (successful) future outcomes, and matching conditional on observable individual characteristics might not suffice to remove selectivity. Stephan (2008) demonstrates empirically that evaluation results vary with the choice of the classification window. Following the majority of the European literature, we do not put any restrictions on the future of persons and define non-participation as not taking up subsidised employment between February and April 2005, but eventually at a later date.

For the programme investigated, a argument against the matching approach may be that we observe not solely labour market outcomes after receiving a subsidy, but rather labour market outcomes of a subsidy in combination with a job offer (Jaenichen/Stephan 2007): First, the fact that someone has been able to find at least a subsidised job, implies that – even conditioning on X – there might be still unobserved individual heterogeneity between participating persons and non-participating comparison persons. This might capture, for instance, the motivation of unemployed individuals and the assessment of their skills by caseworkers and firms. However, unobserved heterogeneity will be strongly correlated with observed explaining variables, in particular an individual's labour market history (Heckman et. al 1999). Since we have comprehensive information on previous employment histories of unemployed persons as well as of their partners this should at least strongly alleviate the problem at hand. Furthermore, we conduct a Rosenbaum bounds analysis (Rosenbaum 2002) to estimate how strongly an unobserved variable would have to influence the assignment process to undermine the results of the matching analysis. Second, subsidised and unsubsidised jobs might be concentrated in different employer segments of the labour market. Since our data do not contain information on employer characteristics, the matching of workers to heterogeneous firms may involve a selection bias (of unknown direction) regarding job quality.

4 Data and applied method

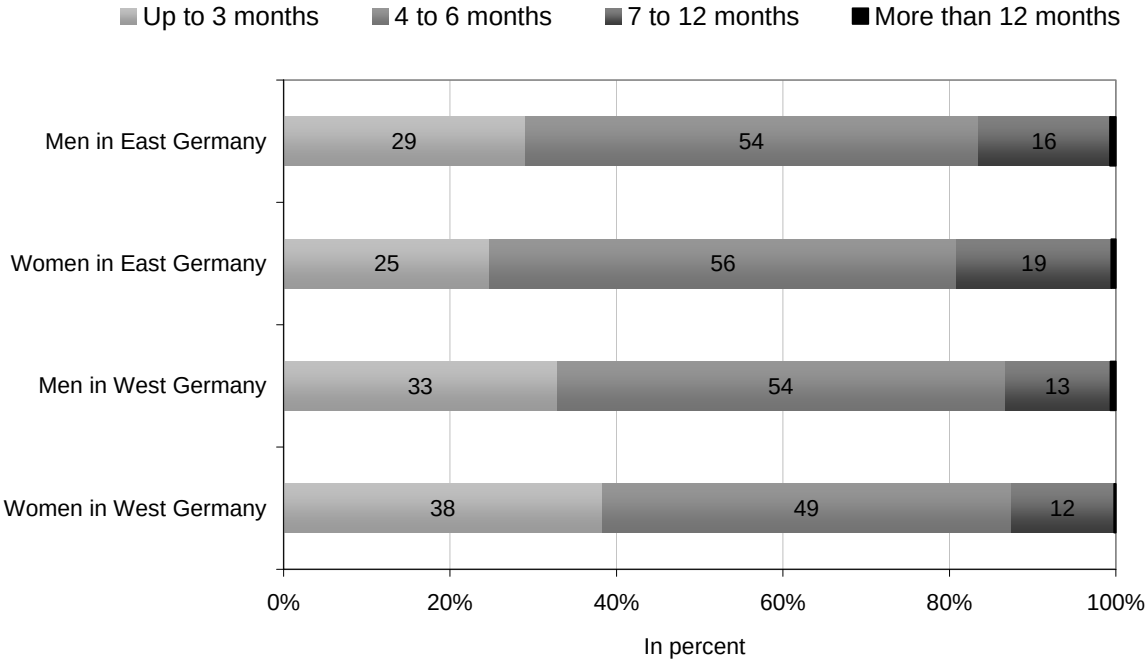
Data and variables

Our empirical analysis uses rich administrative data of the German Public Employment Service. The Integrated Employment Biographies (*Integrierte Erwerbsbiographien,* IEB, versions 5.1/6.0) contain socio-demographic characteristics and individual daily information about employment history, receipt of benefits, job search history and participation on several programmes of active labour market policy. Hummel et al. (2005) and Jacobebbinghaus/Seth (2007) describe a sample of the database that is open for public use through the Research Data Centre of the Public Employment Service. Additional information about unemployment benefit II receipt and household structure are drawn from a history-file on means-tested benefit receipt (*Leistungshistorik Grundsicherung*, LHG, versions 2.0/3.0). Since the latter dataset provides household information, we were able to merge partner information to the individual employment biographies. We thus account not only for the individual employment history, but for the partner's employment history, when modelling selection into subsidised employment. Furthermore, we merge the latest information on the employment status from data marts of the Statistic Department of the Federal Employment Service to compute our outcome variables, which are explained in more detail below.

The potential treatment group consists of all persons who have been registered as unemployed covered by Social Code II on January 31, 2005, and whose subsidised employment started between February and April 2005. The potential comparison group members consist of a 19 percent sample of all unemployed persons covered

by Social Code II on 31 January 2005. Both, treatment and comparison group are restricted to unemployed persons who receive unemployment benefit II, were not older than 57 years, did not participate in any active labour market programme on January 31 2005, and did not have missing data in basic socio-demographic characteristics like age, sex, occupational qualification and migration background. As has already been mentioned, potential comparison group members may not take-up subsidised employment between February and April 2005, but eventually at a later date. Furthermore, from 2005 onwards, data sets from those 69 municipalities opting out of co-operation with the Public Employment Service (*optierende Kommunen*) have not been integrated in our databases yet. Thus we exclude districts, where only municipalities administer unemployment benefit II receipt from further analysis.

Figure 1
Entries into subsidisation covered by Social Code II between February and April 2005 by duration of the subsidy (in percent)



Source: Own calculations, based on IEB V5.01 and V6.01, LHG V2.0 and V3.0, data marts of the Statistics Department of the Federal Employment Agency, without municipalities opting out of co-operation with the Public Employment Service.

We are convinced that a programme is not only characterised by its type, but also by its length. Figure 1 shows that around fifty percent of the subsidies in our sample are granted for four to six months and around thirty percent for up to three months. The share of long-term subsidies is somewhat higher in East Germany than in West Germany, probably because of weak labour market conditions in East Germany. Since our observation period is restricted to 20 months after programme entry, we restrict our analysis on wage subsidies of short-term duration (up to three month) and of medium-term duration (four to six months).

Furthermore, separate analyses are conducted for four main groups, conducted of women and men in East Germany or West Germany. For our largest treatment group, men in West Germany, we present results also by age, occupational qualifi-

cation, migration background and (for those older than 30) time since the end of the last regular job. We use the variables depicted in Overview 1 to model selection into the programme as well as post-programme outcomes.

Our outcome variables are measured at the beginning of each month, up to the 20th month after (hypothetical) programme entry. To compute outcome variables for comparison group members, it is necessary to assign them potential program start dates; we compute these as a random draw from the observed distribution of programme start months of the treatment group. All outcomes are defined as successful events, thus positive average treatment effects will indicate a positive impact of the wage subsidy. In particular, our outcome variables are:

a) Unsubsidised regular employment that is subject to social insurance contributions,
b) Not registered as unemployed and not participating in an active labour market programme,
c) Not receiving unemployment benefits II.

Overview 1
Explaining variables

	Variables
Socio-demographic individual characteristics	Age, migration background, health restrictions, qualification.
Individual labour market history during the last five years	Duration of employment/unemployment/not observable states like out of labour force, participation in active labour market programmes, receipt of unemployment assistance during December 2004, characteristics on the last job (earnings, full/part time, job duration).
Household characteristics	Single/partner, children, partner's qualification.
Partner's labour market history during the last five years	Duration of employment/unemployment/not observable states like out of labour force, participation in active labour market programmes.
Local labour market characteristics	Unemployment rate in 1/2005 and its percentage change during the preceding year, share of long-term unemployed in 1/2005 and its percentage change during the preceding year, vacancy-unemployment ratio in 1/2005 and its percentage change during the preceding year, type of district (classification by Rüb/Werner 2007).
Interaction effects	Individual labour market history by age, partner's labour market history by age.

Note that our evaluation approach implies that participants are sampled conditional on their unemployment exit, while the non-participants, by definition, are unemployed at the beginning of the evaluation period (Jaenichen 2002). Therefore, when computing our outcome-variables a) and b), we do not interpret times of subsidised employment and the obligatory follow-up period of further employment already as a labour market success. Regarding outcome variable c), times of subsidised employment are subject to the usual social security contributions. Thus, subsidised employment will contribute to meet eligibility criteria for unemployment benefit I receipt. If a previously subsidised worker becomes unemployed and fulfils these criteria, he

would avoid receiving unemployment benefit II receipt again. Unlike outcome variable a) and b), which refer only to the individual level outcome, variable c) refers to the household level. Note that persons might even work in a subsidised job and receive unemployment benefit II at the same time, if earnings are not sufficiently high to support a large family.

Table A.1 in the Appendix shows variable means of selected explanatory variables for subsidised workers as well as for our samples of potential comparison persons. Subsidised persons might be regarded to be a positive selection compared to all unemployed. In particular, younger unemployed persons, highly skilled unemployed, individuals without migration background and needy job-seekers who were employed last during 2004 are overrepresented among the participants. Thus there seems to be some cream skimming in the assignment of wage subsidies.

Applied method

Propensity-score matching is a useful simplification of matching on a high-dimensional vector of X-variables. Rosenbaum/Rubin (1983) have shown that it is sufficient to match on the propensity score $Pr(X) = Pr(D^t = 1|X)$ to obtain the same probability distribution for treated and non-treated individuals. Thus, if $(Y_0^{t+h}, Y_1^{t+h} \perp D^t) \mid X$ holds, $(Y_0^{t+h}, Y_1^{t+h} \perp D^t) \mid Pr(X)$ will also be satisfied. Thus we estimate in a first step the propensity score for participants and non-participants by means of a probit model, with X as the vector of exogenous variables. The second step consists of a selection of a comparison group such that the distributions of the propensity scores are balanced for participants and controls. Estimates are performed using the stata-module *psmatch2* (Leuven/Sianesi 2003).

For each group - for instance, West German women, who received a short-term subsidy - we estimate several probit models. We begin with the entire set of covariates and select variable sets that enter the next estimation step: In the first step, a set of covariates is kept in the model, if a Wald-Test on the hypothesis that their parameters are jointly zero indicates that the variable set has a significant impact with $\alpha = 0.5$. During further steps this threshold value is decreased down to $\alpha = 0.1$. Propensity scores are then computed for the remaining group specific model by always accounting for socio-demographic characteristics independent on the results of the preceding test procedure.

We apply six different matching algorithms to check for sensitivity of the outcomes: 1) One-to-one nearest neighbour matching without replacement and caliper 0.001, 2) one-to-one nearest neighbour matching with replacement and caliper 0.001, 3) one-to-two nearest neighbour matching with replacement and caliper 0.001, 4) one-to-three nearest neighbour matching with replacement and caliper 0.001, 5) radius matching with caliper 0.001 as well as 6) radius matching with caliper 0.0005. Note that average treatment effects computed with different matching algorithms hardly differ from each other.

To test for the quality of matching, the mean standardised bias (MSB) (Rosenbaum/ Rubin 1983) between each treated group and its matched comparison group is computed across all variables in X. The standardised bias of a covariate is defined as the difference of means in the treated and matched control sample, divided by the square root of the average sample variance. Thus a lower value of the MSB indicates more similarity between the two groups. In the following we will only present results for the procedures that generally obtain the smallest standardised bias (Rosenbaum/Rubin 1985). These are radius matching with caliper 0.001 for medium-term subsidies and with caliper 0.0005 for short-term subsidies. The MSB after matching never rises above 2.1 percent (Figure 2). Moreover, also t-tests (not displayed here) show that the hypothesis on equality of means of the covariates cannot be rejected after matching. Hence, we achieve a good balancing of the distributions of the explaining variables across treatment and comparison group.

Finally, one might argue that caseworkers and employers, who have to decide to grant a subsidy respectively to recruit a subsidised worker, will probably have additional information – not included in our dataset – about the job-seeker. This information might have an impact on treatment probability and labour market outcomes, but is not included in the data set. We analyse therefore, how sensitive the estimated treatment effects are to a violation of the Conditional Independence Assumption. For this purpose we apply the stata module *mhbounds* (Becker/Caliendo 2007) – available for nearest neighbour matching without replacement – to compute the Mantel-Haenszel statistics for the outcomes in each month after assignment.

Table 2
Rosenbaum-bounds analysis for the outcome variable "not unemployed and not participating in an active labour market programme", 20 months after programme entry

	Short-term subsidy	Medium-term subsidy
Men in East Germany	2.8	3.5
Women in East Germany	5.0	3.6
Men in West Germany	1.8	2.9
Women in West Germany	2.2	2.7

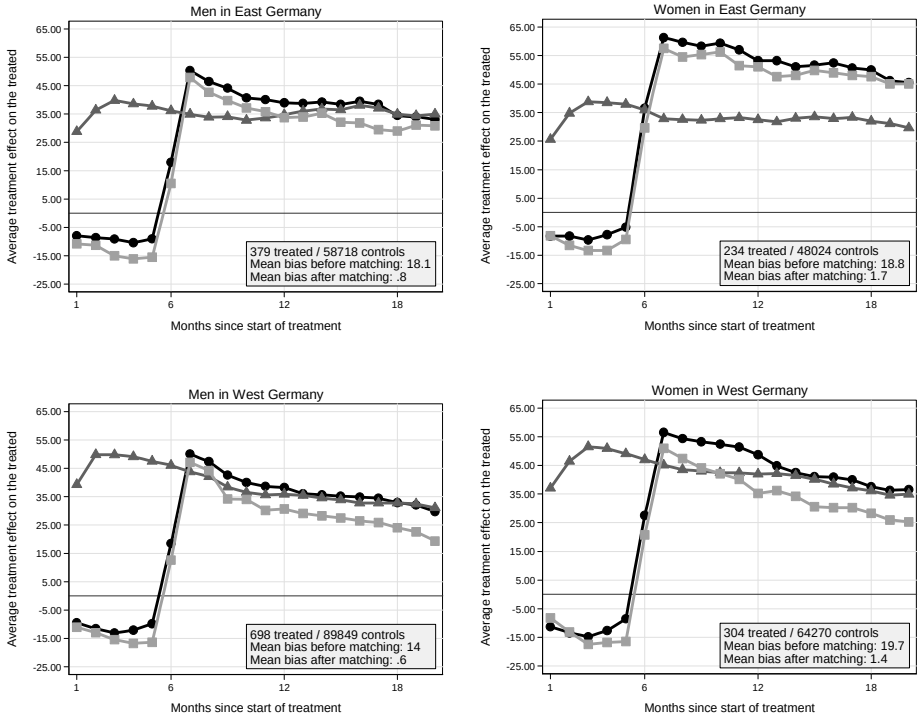
Note: Short-term subsidies are paid for up to 3 months, medium-term subsidies are paid for 4 to 6 months. The Table displays the factor by which unobserved heterogeneity would have to influence selection into subsidised employment to undermine matching results.

Source: Own calculations, based on IEB V5.01 and V6.01, LHG V2.0 and V3.0, data marts of the Statistics Department of the Federal Employment Agency, without municipalities that opted out.

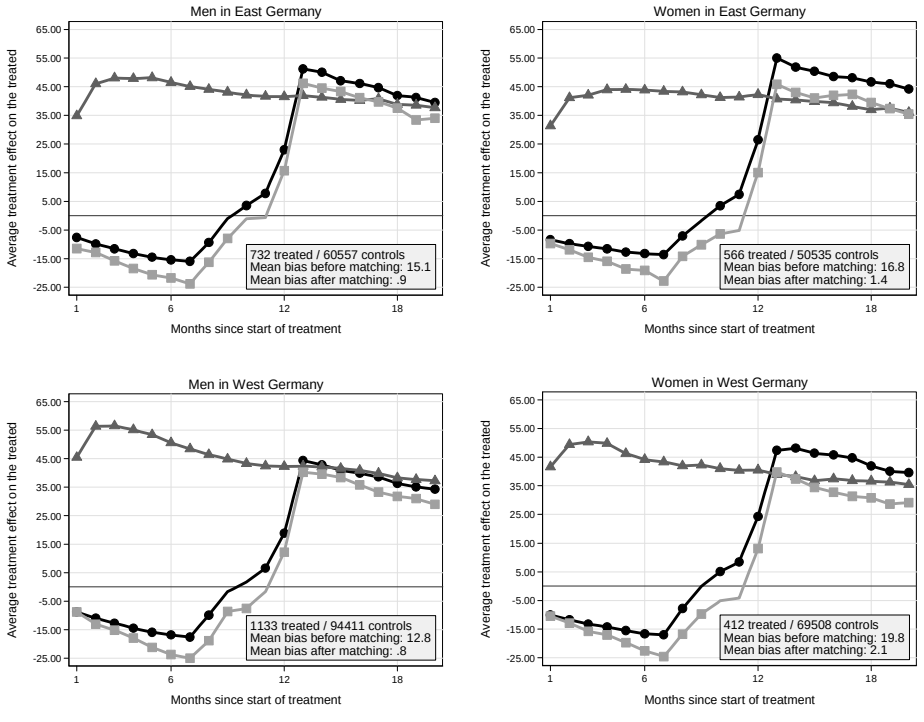
Table 2 reports odd ratios for men and women in East and West Germany; it restricts itself to the outcome variable "not unemployed and not participating in an active labour market programme" and the 20th month after programme entry. The treatment effects of short-term subsidies up to three months are significantly different from zero on a level of $\alpha = 0.05$ for odd ratios between 1.8 and 5.0. For treatment effects of medium-term subsidies between four and six months the odd ratios range from 2.9 to 3.6. The interpretation is, for instance, for a value of 1.8 that the results are insensitive to a bias that would nearly double the odds of treatment. Thus, we are confident that the results are robust with respect to a potential violation of the Conditional Independence Assumption.

Figure 2
Estimated average treatment effects of a subsidy on the labour market prospects of needy job-seekers taking up a subsidised job

Short-term subsidy (up to 3 months)



Medium-term subsidy (4 to 6 months)



Source: Own calculations, based on IEB V5.01 and V6.01, LHG V2.0 and V3.0, data marts of the Statistics Department of the Federal Employment Agency, without municipalities opting out of co-operation with the Public Employment Service.

5 Empirical results

Effects for the main groups

Figure 2 displays in detail the evolution of the estimated average treatment effects over time. Plots above the abscissa have to be interpreted as a "success" of the wage subsidy. Remember that the period of subsidisation as well as the following period, during which the employer is obliged to sustain the employment relationship, are not interpreted as a "labour market success" when computing employment and unemployment outcomes. As can be seen clearly, treated persons were "locked-in" – as a necessary side-effect of the construction of the outcome variables – for the period of subsidisation and for the compulsory period of further employment. We find large and significant positive effects of the wage subsidy on the labour market prospects of participants immediately after the end of the follow-up period, which then decline slightly over time. In fact, the highest treatment effect of 63 percentage points is found for women in East Germany, seven months after the start of a short-term subsidy.

Our main empirical results – for month 20 after treatment start – are also summarised in Table 3. It documents the labour market outcomes as share of treated and of matched comparison persons a) in regular employment, b) not unemployed (or in a labour market programme) and c) no longer receiving unemployment benefit II. Furthermore, the table displays average treatment effects on the treated (ATT) that are computed simply as the difference between labour market outcomes of treated and matched comparison groups.

Table 3
Treated individuals taking up a subsidised job during 2/2005 to 4/2005 and matched comparison persons: Labour market outcome and estimated average treatment effect on the treated (ATT) 20 months after start of the subsidised job

			Short-term subsidy				Medium-term subsidy			
			East		West		East		West	
			Men	Wo.	Men	Wo.	Men	Wo.	Men	Wo.
Share	a) in regular employment	Treated	0.64	0.69	0.62	0.66	0.68	0.67	0.63	0.67
		Comparisons	0.31	0.23	0.32	0.29	0.28	0.23	0.29	0.26
		ATT	*0.33*	*0.45*	*0.30*	*0.37*	*0.40*	*0.45*	*0.35*	*0.40*
	b) not unemployed and not in programme	Treated	0.72	0.79	0.69	0.76	0.74	0.73	0.72	0.76
		Comparisons	0.43	0.39	0.47	0.49	0.40	0.38	0.44	0.47
		ATT	*0.29*	*0.40*	*0.22*	*0.28*	*0.34*	*0.35*	*0.28*	*0.29*
	c) not receiving unemployment benefit II	Treated	0.63	0.53	0.68	0.69	0.64	0.59	0.71	0.67
		Comparisons	0.28	0.24	0.37	0.34	0.26	0.23	0.34	0.32
		ATT	*0.35*	*0.30*	*0.31*	*0.35*	*0.38*	*0.36*	*0.37*	*0.35*
Mean standardised bias		Before	18.1	18.8	14.0	19.7	15.1	16.8	12.8	19.8
		After	0.8	1.7	0.6	1.4	0.9	1.4	0.8	2.1
Observations of treated persons		All	381	236	699	304	735	568	1134	412
		In Support	379	234	698	304	732	566	1133	412

Note: Short-term subsidies are paid for up to 3 months, while medium-term subsidies are paid for 4 to 6 months. All estimated average treatment effects on the treated (ATT) are significant at $\alpha = 0.01$.

Source: Own calculations, based on IEB V5.01 and V6.01, LHG V2.0 and V3.0, data marts of the Statistics Department of the Federal Employment Agency, without municipalities opting out of co-operation with the Public Employment Service.

20 months after taking up the subsidised job, the share of participants in regular employment exceeds 60 percent in all treated groups. Furthermore, it is in most cases nearly 40 percentage points higher than in the comparison groups. While still more participants – more than 70 percent – are neither unemployed nor in any labour market programme, the difference to comparison groups is obviously slightly smaller than looking at employment outcomes: A comparatively higher share of comparison persons than of treated persons withdraws from the labour market as discouraged workers. Finally, also more than 60 percent of the treated do not receive unemployment benefit II for needy job-seekers any longer; the average treatment effect on the treated accounts for 35 percentage points.

Comparisons of estimates between the groups investigated must be interpreted with caution, since characteristics of group members may differ for each group. Nonetheless we would like to draw attention to several aspects:

First, labour market outcomes do not differ much between recipients of short- and medium-term wage subsidies. Thus, it seems that the duration of the subsidy is not necessarily a function of placement difficulties. Treatment effects are mostly higher within groups receiving a medium-term subsidy compared to those receiving a short-term subsidy, if we look at the beginning of the observation period or at its end. However, if we concentrate at the expiration date of the follow-up period, short-term subsidies seems to be more effective than medium-term subsidies: In the first month after the follow-up period had expired (7^{th} month for short- and 13^{th} month for medium-term subsidies since start of treatment), the effects for short-term subsidies are up to nine percentage points higher than for medium-term subsidies.

Second, estimated treatment effects for the outcome variables “regular employed” and “not unemployed and not in a labour market programme” are in the majority of points in time slightly larger a) for female than for male workers and b) for East Germany than for West Germany. The results are mainly due to varying labour market results of the unsubsidised comparison groups – women as well as unemployed workers in East Germany have in general worse labour market prospects than male and West German needy job-seekers.

Third, Table 3 shows that the share of participating persons “not receiving unemployment benefit II” 20 months after programme start is either higher or rather similar to the share in “regular employment”. Noticeable exceptions are women in East Germany, whose share in regular employment is considerably higher than the share for those not receiving benefits (8 percentage points for medium- and 15 for short-term subsidies). This may be a hint that several of these women are working in low wage jobs and receive additional benefits to increase their household income.

Note finally that the share of the comparison group that has taken-up unsubsidised employment – indicating which share of participants should (at least) have also found a job without the help of a subsidy - may be interpreted as deadweight losses

of subsidisation. This implies that the deadweight accompanying wage subsidies for needy job-seekers would amount to at least 20 to 30 percentage points.

Table 4
Subgroups of treated West German men taking up a subsidised job during 2/2005 to 4/2005 and matched comparison persons: Labour market outcome and estimated average treatment effect on the treated (ATT) 20 months after start of the subsidised job

			Age 25-34 years	Age 35-49 years	Age>= 30 years, last unsubsidised employment 2004	Age>= 30 years, last unsubsidised employment 2002/03	Without migration background	With migration background	Without occupational qualification	With occupational qualification
Short-term subsidy										
Share	a) in regular employment	Treated	0.64	0.59	0.66	0.59	0.63	0.60	0.59	0.64
		Comparisons	0.36	0.27	0.34	0.24	0.32	0.28	0.27	0.35
		ATT	*0.27*	*0.32*	*0.32*	*0.35*	*0.30*	*0.32*	*0.32*	*0.29*
	b) not unemployed and not in programme	Treated	0.67	0.69	0.75	0.66	0.68	0.74	0.68	0.71
		Comparisons	0.50	0.41	0.47	0.39	0.47	0.45	0.42	0.50
		ATT	*0.17*	*0.28*	*0.28*	*0.27*	*0.21*	*0.29*	*0.26*	*0.21*
	c) not receiving unemployment benefit II	Treated	0.66	0.68	0.69	0.69	0.71	0.58	0.61	0.73
		Comparisons	0.39	0.31	0.35	0.30	0.37	0.33	0.30	0.41
		ATT	*0.27*	*0.37*	*0.34*	*0.39*	*0.34*	*0.25*	*0.32*	*0.32*
Mean standardised bias (MSB)		Before	16.16	16.15	15.51	16.23	16.33	17.23	16.61	16.30
		After	0.65	0.89	0.63	1.04	0.69	1.50	1.06	0.60
Observations of treated persons		All	299	313	248	173	553	146	262	453
		In Support	297	313	248	173	552	146	262	452
Medium-term subsidy										
Share	a) in regular employment	Treated	0.65	0.62	0.64	0.64	0.64	0.61	0.57	0.68
		Comparisons	0.34	0.24	0.32	0.22	0.30	0.26	0.23	0.32
		ATT	*0.32*	*0.39*	*0.32*	*0.42*	*0.34*	*0.35*	*0.34*	*0.35*
	b) not unemployed and not in programme	Treated	0.76	0.70	0.73	0.69	0.73	0.71	0.67	0.76
		Comparisons	0.47	0.38	0.44	0.38	0.45	0.44	0.40	0.47
		ATT	*0.29*	*0.31*	*0.28*	*0.32*	*0.28*	*0.27*	*0.27*	*0.29*
	c) not receiving unemployment benefit II	Treated	0.72	0.67	0.68	0.71	0.72	0.66	0.62	0.76
		Comparisons	0.36	0.28	0.33	0.28	0.35	0.30	0.27	0.38
		ATT	*0.36*	*0.39*	*0.34*	*0.43*	*0.37*	*0.35*	*0.35*	*0.38*
Mean standardised bias (MSB)		Before	15.06	14.21	12.16	19.13	15.10	13.86	12.97	13.25
		After	0.72	1.01	0.62	1.25	0.74	1.96	1.82	0.56
Observations of treated persons		All	471	515	401	251	885	222	398	709
		In Support	471	514	400	251	885	222	398	709

Note: Short-term subsidies are paid for up to 3 months, medium-term subsidies for 4 to 6 months. All estimated average treatment effects on the treated (ATT) are significant at $\alpha = 0.01$.

Source: Own calculations, based on IEB V5.01 and V6.01, LHG V2.0 and V3.0, data marts of the Statistics Department of the Federal Employment Agency, without municipalities opting out of co-operation with the Public Employment Service.

Effects for subgroups of West German men

Treatment effects might be heterogeneous for unemployed with different characteristics. For male needy job-seekers in West Germany, our number of observations is sufficiently high to perform separate estimates across subgroups. The results are displayed in Table 4 and show that effects differ across groups.

In particular, estimated treatment effects on subsidised persons are slightly larger

- for needy job-seekers between 35 and 49 than for those between 25 and 34 years,
- for individuals without migration background than those with migration background,
- for unemployed persons with occupational qualification compared to those without occupational qualification,
- for previously long-term (at least one year without a job) unemployed needy job-seekers older than 30 than for those who were only short-term unemployed.

Thus, it seems that the effectiveness of targeted wage subsidies has been higher for groups with particular placement difficulties. The underlying reason is probably that these groups have more problems to find a regular job without the help of a subsidy. This might be more easily achieved for persons without migration background, with occupational qualification and shorter unemployment duration. Subsidies might thus create an opportunity for hard-to-place individuals to disclose their potential productivity - which is a-priori supposed to be low - to an employer.

Comparison with findings for the pre-reform period

Does the effectiveness of wage subsidies differ between needy job-seekers in the post-reform period and the entire group of unemployed persons in the pre-reform period?

Table 5 displays findings of ZEW et al. (2006), where several groups of individuals – consisting of unemployment benefit recipients as well as unemployment assistance recipients – taking up a subsidised job during the second quarter of 2002 were analysed. Results are shown for 20 months as well as 36 months after programme start.

The effects of a subsidy on the subsequent employment rates of participants 20 months after programme start are partly higher, partly lower across the investigated groups of needy job-seekers. However, the effects on rates “not unemployed or in a labour market programme” are in most groups investigated larger across recipients of unemployment benefit II than they were in the pre-reform period.

That may be cautiously taken as a hint that wage subsidies are not less effective for recipients of basic social care than they were for former recipients of unemployment benefit or unemployment assistance. Note also that the cited study showed that estimated treatment effects decrease further between 20 and 36 months after taking up a subsidised job, but remain still significant at $\alpha = 0.05$ at the end of the observation period.

Table 5
Treated individuals taking up a subsidised job during the second quarter of 2002 and matched comparison persons: Labour market status and estimated average treatment effect on the treated (ATT) 20 months and 36 months after start of the subsidised job

			Short-term subsidy training requirements				Medium-term subsidy training requirements				Medium-term subsidy for hard-to-place			
			East		West		East		West		East		West	
			Men	Wo.	Men	Wo.	Men	Wo.	Men	Wo.	Men	Wo.	Men	Wo.
20 months after programme start														
Share	a) in regular employment	Treated	0.62	0.62	0.65	0.69	0.70	0.73	0.62	0.71	0.54	0.62	0.50	0.62
		Comparisons	0.40	0.28	0.29	0.30	0.34	0.26	0.31	0.27	0.23	0.15	0.21	0.21
		ATT	*0.22*	*0.34*	*0.36*	*0.39*	*0.36*	*0.47*	*0.31*	*0.43*	*0.31*	*0.47*	*0.29*	*0.41*
	b) not unemployed and not in programme	Treated	0.66	0.69	0.72	0.77	0.74	0.77	0.71	0.81	0.60	0.67	0.60	0.72
		Comparisons	0.54	0.40	0.48	0.57	0.46	0.41	0.49	0.58	0.36	0.28	0.40	0.50
		ATT	*0.13*	*0.30*	*0.24*	*0.20*	*0.28*	*0.37*	*0.22*	*0.23*	*0.24*	*0.39*	*0.19*	*0.22*
36 months after programme start														
Share	a) in regular employment	Treated	0.61	0.68	0.61	0.69	0.67	0.71	0.62	0.65	0.50	0.65	0.50	0.56
		Comparisons	0.42	0.33	0.35	0.36	0.33	0.35	0.34	0.32	0.24	0.24	0.23	0.23
		ATT	*0.19*	*0.35*	*0.26*	*0.33*	*0.34*	*0.36*	*0.28*	*0.33*	*0.26*	*0.42*	*0.27*	*0.34*
	b) not unemployed and not in programme	Treated	0.67	0.74	0.71	0.79	0.73	0.77	0.75	0.80	0.60	0.72	0.62	0.73
		Comparisons	0.56	0.54	0.57	0.68	0.50	0.56	0.58	0.69	0.44	0.44	0.47	0.58
		ATT	*0.11*	*0.20*	*0.14*	*0.11*	*0.23*	*0.21*	*0.17*	*0.11*	*0.15*	*0.28*	*0.15*	*0.14*
Observations			949	346	948	562	2462	1266	1106	1019	339	242	1269	597

Note: Short-term subsidies are paid for up to 3 months, while medium-term subsidies are paid for 4 to 6 months. All estimated average treatment effects on the treated (ATT) are significant at $\alpha = 0.05$.

Source: ZEW et al. (2006), Table A.4.4.

6 Conclusions

As we have noted in the introduction, it has not been obvious ex-ante that previous results on the effectiveness of wage subsidies would hold also for needy jobseekers receiving unemployment benefits II, a group that as such exists in Germany only since 2005. Our study present a first assessment of the effectiveness of wages subsidies for this group, which now encompasses the majority of unemployed persons in Germany.

Our results suggest that short and medium-term targeted wage subsidies improve the subsequent labour market prospects of needy job-seekers in Germany: 20 months after taking up a subsidised job the share of treated persons in regular employment is around 40 percentage points higher than within comparison groups. The estimated effects on the shares not unemployed and the share not receiving basic social care any longer are slightly smaller. Groups with particular placement difficulties benefit comparatively more from subsidisation. Furthermore, the results do not differ much from those obtained for participants from the entire group of unemployed persons during the pre-reform period.

The positive findings are in line with international results on the effectiveness of wage subsidies. A Rosenbaum-bounds analysis suggests that our results are quite robust against hidden bias. In consequence, one might conclude that wage subsidies are an effective means to improve the economic self-sufficiency of previously unemployed workers.

However, some caveats are in order: First, effectiveness of a programme on the individual level does not imply that the programme is also cost-efficient – the data contain, however, no individual information on the amount of the subsidy. Second, deadweight losses might be a serious problem – considerable shares of participating persons might have got the job also without subsidisation. Thus the allocation of subsidies has to be monitored carefully by the Public Employment Service and its caseworkers. Also incentive structures in the governance of the Public Employment Service have to be shaped in a way that collusion between caseworkers and firms can be ruled out. Third, our applied method does not identify potential displacement and substitution effects – subsidised persons will certainly substitute other workers. Nonetheless, this does not prevent overall effects for an economy might be positive (Calmfors 1994); but overall effects might only be identified on the macro level. Fourth, an arbitrarily expansion of the programme is prevented since wage subsidies will only be granted if a firm is willing to recruit the unemployed person in question and if the caseworker approves subsidisation because of individual placement restraints. Finally, groups with particular placement difficulties seem to benefit comparatively more from subsidisation. Thus an extension of the programme on other groups might decrease its effectiveness.

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Appendix

Table A.1
Variable means of selected attributes (0 = no, 1 = yes) in percent for potential comparison (PC) and treated (T) persons.

	Short-term subsidy								Medium-term subsidy							
	East				West				East				West			
	Men		Women		Men		Women		Men		Women		Men		Women	
	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T	PC	T
Age < 25	11	15	11	19	10	13	12	15	10	18	10	16	10	11	12	14
Age 25-34	23	32	21	27	24	36	24	30	23	30	22	27	24	33	25	26
Age 35-49	47	46	48	48	47	45	45	51	47	43	48	49	47	47	46	51
Age 50-57	20	6	20	6	19	6	18	5	20	10	20	8	19	9	18	9
Migration background	8	4	9	3	25	21	26	13	8	4	9	2	24	20	25	13
Childless single	62	61	30	36	62	62	36	51	62	61	30	32	62	63	35	49
Couple	9	8	10	8	5	5	7	5	9	11	10	7	5	5	7	7
Lone parent	2	1	24	25	1	2	21	27	2	2	24	29	1	1	21	22
Married	27	30	36	29	31	31	35	16	27	26	36	32	31	30	35	21
Without qualification	13	3	13	2	22	12	28	4	13	3	13	2	22	12	27	6
Lower secondary school	12	6	11	2	27	19	27	19	12	7	11	3	27	20	27	17
Vocational training	29	28	20	10	29	41	19	29	29	25	20	12	30	37	20	30
Higher secondary school	6	4	7	5	6	6	8	5	6	4	7	4	6	4	7	5
with vocational training/higher education	40	60	48	81	16	21	18	43	40	60	48	79	16	27	19	42
Last regular job 2004	24	42	28	42	23	35	26	40	24	35	28	45	22	37	26	38
Last regular job 2002/2003	17	14	14	16	21	25	17	20	17	18	14	15	22	23	17	22
Last regular job before 2002	37	9	38	10	34	7	34	9	37	12	38	12	35	13	34	13
Number of observations	58768	381	48092	236	89892	699	64320	304	60582	735	50540	568	94423	1134	69528	412

Note: Short-term subsidies are paid for up to 3 months, while medium-term subsidies are paid for 4 to 6 months.

Source: Based on IEB V5.01 and V6.01, LHG V2.0 and V3.0, data marts of the Statistics Department of the Federal Employment Agency, without municipalities opting out of co-operation with the Public Employment Service.

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