Employer Wage Subsidies and Wages in Germany:
Some Evidence from Individual Data

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Abstract: In Germany, targeted wage subsidies to employers are an important instrument of active labor market policy. This paper utilizes process generated data of the German Public Employment Service to compare the wages of individuals taking up a subsidized job with those of otherwise similar individuals who found an unsubsidized job. The results indicate that subsidized jobs are not associated with gains or losses regarding daily wages, which might be contributed to wage setting within the German system of industrial relations. Nonetheless, because subsequent employment rates of subsidized persons are higher on average, we find a positive relationship between cumulated wages and subsidization.

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1   Introduction

Targeted wage subsidies are tailored to particular groups of unemployed persons and typically granted for a limited period of time. They temporarily reduce a firm's labor costs for hiring and employing previously unemployed persons and can thus trigger the placement of such persons into jobs. To motivate a firm to hire a particular unemployed person for a particular job, a period of subsidization might prove necessary for several reasons: First, a worker's skills might not match the requirements of a job, but the mismatch is expected to diminish with training on the job. Second, a period of subsidization reduces an employer's uncertainty – which might be particularly high for previously long-term unemployed persons – about the job applicant's productivity and thus serves as a screening instrument. Third, institutional factors such as minimum wages or collectively negotiated wages might drive a wedge between individual productivity and wages. Of course, the longer term effects of the subsidy depend on the issue whether the gap between the offered and the accepted wage of a worker can be closed during the subsidization period.

In Germany, targeted wage subsidies paid to employers are an important instrument of active labor market policy: During 2003, more than 180,000 subsidized jobs were taken-up. While the number of entries into the program decreased to 134,000 in 2005, afterwards they increased again, up to around 250,000 in 2007 and 2008. Transitions into subsidized jobs accounted for roughly 3 percent of all transitions out of unemployment in Germany during 2004 (Rothe 2007). Within our sample of medium-aged unemployed persons entering employment during the second quarter of 2003, as much as 6 percent of all transitions out of unemployment into employment were subsidized.

Our study presents first results on wage rates paid in subsidized jobs in Germany. In particular, we ask whether workers taking up a subsidized job during the second quarter of 2003 experienced wage gains or wage losses compared to otherwise similar, but unsubsidized workers. This question is of political importance, because wage subsidies are intended to compensate employers for a temporarily reduced productivity of subsidized workers. Thus, if we observe wage gains of subsidized workers this could be a hint on

unintended side effects of the program. No explicit upper or lower bounds on wages are prescribed by law, but might be provided at the local level.

To compare wages in subsidized and unsubsidized jobs, we combine propensity score matching with a difference-in-differences strategy. We have no information whether subsidies were really required to induce a firm to hire and subsequently employ a subsidized worker, thus we cannot interpret our results in a causal way. Nonetheless, we obtain some interesting results: We show for our full sample that subsidized workers in Germany receive daily wages that are not significantly different from those of similar unsubsidized workers. However, taking into account that the subsequent employment rates of participants are higher, we find a significant positive effect on cumulated wages during our observation period of 3.5 years. If we restrict our analysis to a sample of firms hiring subsidized as well as unsubsidized workers, we obtain again mostly insignificant differences across subsidized and similar unsubsidized workers and higher subsequent employment rates of subsidized workers.

We interpret our findings mainly in the light of the German system of industrial relations: In Germany, collective contracts (still) play an important role for wage setting, and wages are usually attached to jobs rather than to individual workers. This implies that lower or higher wages for subsidized workers within similar jobs compared to unsubsidized workers might be perceived as unfair and not acceptable by workers and firms as well as by caseworkers of the Public Employment Service. Furthermore, wage undercutting might be infeasible, because subsidized jobs are in average rather low-wage jobs. However, these results do not rule out that a widespread use of wage subsidies for unemployed persons – as we observe in particular in East Germany – increases individual reservation wages and thus prolongs individual unemployment duration.

In the following, Section 2 discusses the relationship between wages and wage subsidies. Section 3 provides details on the program analyzed as well as on the data set, while Section 4 describes the econometric strategy. Section 5 presents the empirical results; Section 6 summarizes and draws some conclusions.

2   Wage subsidies and wages

In the following, we will first summarize findings from empirical studies. Because the effect of subsidies on cumulated earnings hinges on employment rates, we will also briefly discuss studies focusing on employment outcomes. Second, we sketch theoretical approaches analyzing the impact of subsidies on wages and employment. Third, we will briefly describe the institutional background for wage-setting in Germany and its implications.

Empirical evidence on the wage effects of targeted wage subsidies is rather sparse. In Sweden, temporarily subsidized jobs offer an opportunity to acquire job-specific human capital; the decision to join a program is made jointly by the unemployed person and his or her caseworker. Adda et al. (2007) presented descriptive evidence for a sample of young workers that those subsidized earned 3.5 percent more than other previously unemployed workers. However, these results do not account for the dynamic selection process into programs. They then developed and calibrated a structural model, which showed that subsidized jobs increased earnings very moderately and by less than half the amount that participation in a regular job did. They speculated that subsidized work may contribute less to human capital formation than regular work. Furthermore, the opportunity of program participation might have raised the reservation wage for the treated and have delayed their entrance into employment.

For the State of Wisconsin, Hamersma (2005) analyzed the "Work Opportunity Tax Credit" and the "Welfare-to-Work Tax Credit". The subsidy applies to members of certain disadvantaged groups and long-time welfare recipients, respectively. For both programs, employers have to apply in writing at the State Employment Security Agency and – if eligibility of applicants or new hires has been certified – claim the time limited subsidy that covers a share of the wage costs on their federal tax return. Hamersma estimated the effect of these subsidies on wages and tenure of subsidized workers, using propensity score matching to select a comparison group of eligible, but not certified workers. As a result, she found significantly positive effects on wages in subsidized jobs – around 40 percent of the tax credit was passed through to workers in the form of a wage premium. Effects of participation in a subsidized job on tenure were insignificant,

however. In a companion paper, Hamersma (2006) showed that showed that those firms where a larger fraction of workers reached certain job-duration thresholds were more likely to apply for a tax credit.

A very different result had been obtained in an earlier study for the State of Illinois, where also the selection process into the program differed: Dubin & Rivers (1993) presented results from an experiment where randomly selected workers had the opportunity to place a subsidy voucher. They found that wages were highest for unemployed that refused to participate, followed by the control group; wages were lowest for those who actually used the voucher. They explain this result by self-selection of experimental participants – subsidies were typically refused by high-wage earners, who were reluctant to identify themselves as beneficiaries of the government. In a recent study, Brouillette & Lacroix (2008) obtained similar conclusions. They analyzed the Canadian "Self Sufficiency Project", where previously randomly selected unemployed persons, who then became eligible (after 12 months of unemployment) and qualified (through taking up a full-time job within 12 months after establishing eligibility), received a generous in-wage benefit. They showed that participating treatment group members earned less than control group members – but only some of those who were assigned to the treatment group actually participated in the program: In particular, individuals with a low expected wage rate had an incentive to participate in the income supplement scheme, assuming they received an offer, whereas those with high expected income did not participate.

Similar to the effect of subsidies on wages, rather few studies concentrate on the effect on subsidies on tenure. For West Germany, Ruppe (2009) found that subsidies decreased the risk of ending an employment relationship considerably, resulting in higher survival rates and longer tenure of previously subsidized employment relationships. Some studies applying duration models focus on the Belgium labor market: Cockx et al. (1998) conducted comparisons of subsidized and non-subsidized individuals taking up a job, utilizing data from firms on their last five recruitments. They found positive, but insignificant effects of the subsidy on job tenure. Göbel (2006, 2007) analyzed the effects of subsidized employment on labor market transitions of young long-term unemployed workers. His main result was that participation in subsidized employment had a

positive effect on the duration of the first employment spell, in particular during the first year of participation.

A large number of studies, however, have estimated the impact of targeted wage subsidies on the employment prospects of participants, compared to unemployed non-participants. Most authors constructed comparison groups of similar, but non-treated individuals using statistical matching techniques and non-experimental data. For Germany, Jaenichen (2002, 2005) and Jaenichen & Stephan (2009) used this approach and showed that participants in different kinds of targeted wage subsidies schemes had much higher subsequent employment rates than similar unemployed persons, who did not take up a subsidized job. Likewise, evidence for Britain (Dorsett 2006) and Sweden (Sianesi 2008, Carling & Richardson 2004, Fredriksson & Johansson 2004, Forslund et al. 2004) suggested that wage subsidies had a positive effect on employment probabilities of the participants. Turning to the few results from social experiments on subsidy vouchers, Burtless (1985) found that unemployed persons with a voucher were less likely to find employment than job-seekers without vouchers. However, Dubin & Rivers (1993) obtained an increased probability of reemployment for the treated groups, when taking into account self-selection into voucher usage. Boockmann et al. (2007) investigated the effects changes in the legislation regarding German wage subsidies and concluded that increases in subsidized employment were mostly absorbed by deadweight losses.

Wage subsidies are incorporated into a variety of theoretical models. In simple static models, a hiring subsidy is treated as a cost reduction of labor (Bell et al. 1999). If subsidies lower the total factor costs and these are not passed on to consumers through a reduction of prices, the subsidy shifts the labor demand curve upwards. Employment as well as the wage rate increases, while the size of the effects depends on the elasticity of labor demand and supply. In case of a binding minimum wage, a wage subsidy might induce firms to hire more workers just at the threshold, without actually increasing wages. However, targeted wage subsidies only reduce the relative costs of particular workers, thus they should at the same time incur a substitution for relatively more expensive factors of production (as other workers and capital). Furthermore, some of those subsidized might have been recruited anyway at the same wage, inducing deadweight losses.

Calmfors (1994) highlighted also that the labor supply or wage setting curve, respectively, can shift upwards as well, if wage subsidies are quantitatively important enough to lessen labor market pressure. Adda et al. (2007) draw attention to the fact that the availability of wage subsidies might have an impact on the behaviour of unemployed persons. A widespread use of subsidies might decrease the incentive to accept an offer for a lower paid unsubsidized job and increase an individual's reservation wage, thus prolonging individual unemployment duration.

Recent theoretical literature on wage subsides is mostly based on search or matching theories (Mortensen & Pissarides 1994). Within this branch of the literature, an important distinction has to be made between general wage subsidies – paid to all low-wage workers – and targeted wage subsidies or hiring subsidies that are tailored to particular groups of unemployed persons. In addition to developing their own models, Brown et al. (2006) as well as Jahn & Wagner (2008) summarize the comprehensive literature in this field. An important feature of most studies is that wages are the result of a Nash bargain and that part of the subsidy is handed over to workers through rent sharing. For instance, Hamersma (2005) formulated a search model with a minimum wage, targeted wage subsidies (paid for an unlimited time period) and uncertainty on the productivity of a worker-firm match. Her main result is that employment is higher for subsidized workers and their wages increase above the minimum wage even at lower level of productivity than for unsubsidized workers. Thus, subsidized workers receive higher wages than unsubsidized workers of the same ability. The effect of the subsidy on tenure remains ambiguous, however. On the one hand, subsidized workers are less productive; on the other hand, the subsidy decreases the risk of ending the employment relationship. Cahuc & Zylberberg (2004, Chap. 11) analyzed general wage subsidies, paid permanently for all low-wage earners in an economy, regardless of their employment history, within a matching theory framework. An important finding of their study is that the efficiency of the subsidy depends crucially on features of the system of unemployment compensation. Mortensen & Pissarides (2003) draw attention to the fact that, in a dynamic setting, hiring subsidies could also encourage firms to terminate jobs sooner to take advantage of the subsidy from new job creation.

Given that search and matching models usually assume that wages result of a Nash bargain, most models predict that worker might participate in rents generated by wage subsidies. In Germany, the institutional setting should also play a major role in determining wages of subsidized workers: Legislation prescribes that the collectively negotiated or local customary wage level cannot be exceeded when determining the size of the subsidy. While no explicit upper or lower bound is provided by law, subsidies may be refused by caseworkers, if they undercut the collectively negotiated or local customary wage level (see Section 3 for further details).

Dustmann et al. (2009) analyzed recent changes in the West German wage structure during the 80s and 90s. The authors argue that the decline in unionization Germany experienced in the 90s is responsible for a rise in lower tail inequality of wages over that period. Nonetheless, during 2007 still around 80 percent of workers in the private sector were employed in firms at least applying collectively negotiated contracts in West Germany, while 62 percent were so employed in East Germany (Kohaut & Ellguth 2008). Unions try to standardize and compress wages between as well as within firms, in particular by attaching wages to job-grades: Wage compression strengthens the organizational unity among workers with different skills and tasks up to a certain degree (Freeman & Medoff 1984); and union members might have preferences for wage compression, if the mean exceeds the median wage or if they are risk-averse and uncertain about the future development of their wages (Agell 1999, 2002). Importantly, German firms applying collective contracts usually do not differentiate between workers with and without union membership (although they are not obliged to pay union wages to non-union members). Furthermore, because collective wage contracts are much more important in Germany than in North America, they constitute reference wages which might be perceived as fair by many workers and might invigorate workers' sense of entitlement (Holden 1994, Gerlach et al. 2008). Franz & Pfeiffer (2003) surveyed managers from about 800 firms and found that wage rigidities in German labor markets for less qualified workers seem to arise mainly due to collective contracts, whereas rigidities for highly skilled workers are rather the result of efficiency wage considerations. To conclude, the ubiquity of collective contracts implies that lower or higher wages for subsidized workers than for unsubsidized workers within similar jobs might also be supposed

to be less acceptable in Germany than for instance in North America – by workers and firms as well as by caseworkers.

3 Program features and data set

Our study analyzes two variants of a wage subsidy program to employers – called "Eingliederungszuschuss" – that were in place in Germany during the period 1998 to 2003. The first variant was characterized by a rather low level of targeting, compensating for special training requirements, while the second variant was aimed at hard-to-place unemployed with severe problems of reintegration (like long-term unemployed or disabled persons). The subsidy for training requirements could be granted for up to 30 percent of monthly wages for up to 6 months, while the subsidy for hard-to-place persons could regularly account for as much as 50 percent of the monthly salary and continue for at most 12 months (these limits could be exceeded in exceptional cases). If a subsidized person had been dismissed within a follow-up period (usually of the same length as the duration of the subsidization) for reasons attributable to the employer, the employer could be asked to reimburse part of the subsidy. A subsidy could not be granted, if the worker had previously been regularly employed at the firm applying for the subsidy during the last four years, or if another employee had been dismissed to hire a subsidized worker instead.

Contrary to much of the US experience, wage subsidies in Germany were not granted through vouchers during the time period under consideration. Instead, caseworker in local employment agencies had latitude in the allowance decision as well as in the fixing of the amount and duration of the subsidy. Most often, employers took the initiative and negotiated with the local labor market office over a subsidy to be granted, if hiring a particular unemployed worker (ZEW et al. 2006, p. 53 ff.). However, caseworkers also might have offered a subsidy for particular worker-job-matches, if a firm had asked the local labor market office for applicants. Furthermore, caseworkers might also have promised unemployed persons to grant a subsidy, if they obtain a job offer, to be used as an instrument of self-marketing during job-search. In any of these constellations, the decision to support an unemployed with a wage subsidy had to be reasoned in each indi-

vidual case; size and duration should be determined by productivity deficits of the worker in the particular job.

In fixing the amount of the subsidy, the law prescribes that only wages up to the collectively negotiated or the local customary level, respectively, and up to social security thresholds could be taken into account. Wages as such might be lower or higher from a legal perspective. But informally, a lower bound for subsidized wages seem to exist also: ZEW et al (2006, p. 55) reported from caseworker interviews that wage rates undercutting the local customary level by 20 percent or more are given as reasons to refuse the subsidy. Our own small-scale enquiries in the Public Employment Service showed that – while no written instructions are available – there seems to be a consensus that subsidies should not support wage dumping and that the subsidized wages should not be below the local customary wage level.

Hartmann (2004) conducted a comprehensive study of the importance of a wide range of wage subsidy variants for firms and their hiring behavior. Case studies of firms showed that firms often utilize subsidies to improve their competitiveness. On the other hand, flexibility requirements deterred firms from using subsidies and to hire marginal or part-time employees instead. Another point against wage subsidies occurred, if firms could not predict labor demand in the longer run (p. 51 f.). Based on a firm survey related to 3500 subsidized hires, Hartmann also tried to estimate the amount of deadweight losses by asking firms, if they would have hired the same person without the support of a subsidy. For the programs under consideration in our study, firms answered that around 40 to 60 percent of subsidized persons would have been hired also without the help of the subsidy (p. 93). Around 20 to 30 percent points of subsidized persons would have been recruited anyway and have at the same time been suggested for the job by the caseworker. Generally, deadweight losses are smaller for workers with more severe obstacles to reintegration. Furthermore, firms revealed that the main integration problem of hard-to-place workers were not individual productivity deficits as such, but rather that firms ascribed productivity deficits to applicants that had been long-term unemployment or had little labor market experience (Hartmann, p. 147). In fact, the original assessment of productivity deficits had to be revised in a considerable number of cases (pp. 198). These results are in line with findings of the implementation study from a survey of 34

firms, presented in ZEW et al. (2005, p. 140 ff.). 28 of 34 firms answered that hiring decisions did not depend critically on subsidization opportunities. Furthermore, the surveyed firms mostly tried to take advantage of subsidies, if they were uncertain about an applicant's productivity.

To investigate the wage effects of the subsidy variants under consideration, we utilize an excerpt from the Treatment Effects and Prediction data (TrEffeR) of the German Public Employment Service (Stephan et al. 2006). The data cover the years 2000 to 2007 and combine data flows from the distinct computer based operative systems of the Public Employment Service on periods of registered job search, registered unemployment, participation in labor market programs and employment. Even though the TrEffeR data set is not available for public use, it is composed of the same data flows as the Integrated Employment Biographies (IEB) of the Institute for Employment Research. Hummel et al. (2005) describe an IEB sample that is open for public use through the Research Data Center of the German Public Employment Service.

Because the TrEffeR data provide only sparse information on employment periods, we add information on the characteristics of the job – in particular on wages – from the employment history files (BeH) of the Institute for Employment Research (IAB). These files provide more detailed information on wages and on the establishment; they are based on notifications of employment to social security bodies. Daily wages are computed by dividing the entire payment during an employment spell by the duration of the spell in days (including days without work). However, there is an upper bound on the wage information at the social security thresholds. Regarding the duration of subsidization, the data provide information on factual, but not on planned program duration. For the merged data set, we had to correct several smaller inconsistencies. Regrettably, the data do not provide information on working times of individual workers and whether an employer applies a collective contract.

The sample underlying the estimates covers all individuals who entered full-time employment during the second quarter of 2003 after a period of unemployment for up to one year. Our analysis takes into account only individuals aged 25 to 49 at the beginning of this unemployment spell, since younger and older persons might be eligible for specific programs for their age groups. Furthermore, we restrict our analysis to individuals

who were not registered as unemployed for at least three months prior to the unemployment spell. Individuals might have participated in other programs earlier during their unemployment spell. Among participants in the wage subsidy schemes, we excluded those whose subsidization period exceeded one year. Among individuals not participating in the subsidy schemes, we exclude those who had a previous employment spell within the same firm during the first quarter of 2003 already. While our sample is restricted to individuals entering a full-time job during the second quarter of 2003, these persons may also be observed in marginal employment or part-time employment at some points of time during the entire observation period, ranging from 2000 to 2007.

When computing the wage outcome variables, we exclude all marginal employment spells and spells with a daily wage rate of less than 10 Euro from our analysis as well as further periods of subsidized employment. If we observe parallel employment spells, we pick out only the spell with the highest daily wage rate (another possibility would have been to add up wage rates at each point of time). Finally, the employment history files cover only information on wages subject to social security contributions – which excludes self-employment – and information up to the social security threshold. We abstain from imputing estimated wage rates for censored wages (see for instance Gartner 2004), because for our samples of treated and comparison persons wages very seldom reach the social security threshold of around 165 Euro per day. Instead, we exclude those – very few – individuals who earned a daily wage rate of more than 170 Euro during our observation period.

Because wages usually are lower in East Germany than in West Germany, and lower for female compared to male workers, we present separate results by gender and region. Even though we display only findings from joint estimates for both variants of wage subsidies under consideration, we conducted also separate estimates for both variants and describe the results briefly.

4 Estimators of interest and econometric approach

We are interested in the mean difference of wages between workers taking up subsidized employment during the second quarter of 2003 and otherwise comparable workers

who started an unsubsidized employment relationship during this time period. However, we can expect subsidized workers to be a "negative" selection of all newly hired workers – otherwise they would probably not have needed a subsidy to obtain employment. Thus, comparisons of the full samples of subsidized and unsubsidized workers would reflect to a certain degree the selection of workers – affected by themselves, by case-workers and by firms – into subsidization. To account for observed differences between the two groups, we select groups of workers that are similar to the subsidized ones using statistical matching methods (Rosenbaum & Rubin, 1983). We estimate a binary probit to estimate the probability to be subsidized for each individual taking up a job – the propensity score – and select a comparison group of newly hired unsubsidized workers such that the distributions of the propensity scores are similar for both groups of workers.

The process generated data that we use entail a comprehensive number of variables describing individual and firm characteristics as well as the regional labor market. These variables should be crucial for the assignment process into subsidized employment as well for the subsequent wage outcomes and can thus be utilized to choose a comparison group of individuals entering unsubsidized employment by means of propensity score matching. In detail, our choice of comparison groups is based on the variables described in Table 1, which are mostly categorized as dummy variables. Note that wage subsidies are often combined with short-term training measures in firms, often within the same firm. We do not account for participation in a short firm-internal training that took place directly within the month before taking up the job, because – instead of making treated and non-treated persons more similar – this would indicate heterogeneity: Some participants in short-firm internal training might have turned out to be sufficiently productive for an unsubsidized job, whereas other have not.

[Table 1]

We perform a radius matching (Dehejia & Wahba, 2002) that matches participants with "synthetic comparison persons", composed of a weighted equivalent of all persons falling within the radius of their propensity score, and apply a caliper – a maximum distance of propensity scores between treated and comparison persons – of 0.0005. Estimates are performed using the stata module *psmatch2* (Leuven & Sianesi 2003). Note that we conducted several robustness checks of our estimates and experimented with

different calipers as well as different matching algorithms, and present those with a particular good matching quality. However, our results regarding wage differences between treatment and comparison group turned out to be very stable, regardless of the particular matching algorithm or caliper chosen.

For a first assessment of wage differences between the treatment group and the comparison group chosen by propensity score matching, we study three outcome variables:

1a) The daily starting wage when taking up a job during the second quarter of 2003.

1b) The mean daily wage when employed during the 3.5 years after taking up this job.

1c) The mean daily wage during the 3.5 years after taking up this job, imputing a wage of zero for times without regular employment, thus mirroring the development of cumulated wages.

However, propensity matching might not be sufficient to balance features between subsidized and unsubsidized workers – while the one group was able to find an unsubsidized job, the other was at least partly not able. To account for remaining time-constant unobserved heterogeneity between the treatment and the comparison group, we investigate also the development of wages before and after the relevant job has been taken up, thus applying a difference-in-differences strategy. For this purpose we compute:

2a) The difference between 1a) and the latest daily wage observed in the three years preceding the entry into the analyzed job, imputing a wage of zero if the worker has not been employed during this time period.

2b) The difference between 1b) and the mean daily wage when employed during the 3 years preceding the entry into the analyzed job.

2c) The difference between 1c) and the mean daily wage during the 3 years after taking up this job, imputing a wage of zero for times without regular employment, thus displaying the difference in cumulated wages over time.

Finally, firms that hire subsidized workers might also be inherently different from firms that do not utilize subsidies. For instance, managers of these firms might have stronger social attitudes than managers of other firms. In particular, firms where learning on the job enhances productivity considerably might be suited to close a temporarily productiv-

ity gap of newly hired workers by means of a subsidy. Also, firms with comparatively low settling-in costs may take the risk to hire persons with an "unemployment stigma", if this risk is reimbursed by means of a subsidy. Given that we already account for several firm characteristics in our propensity score estimates, we thus conduct an additional analysis restricted to the sample of firms that hired at least one subsidized and one unsubsidized worker during the second quarter of 2003. For this subset, we reduce the caliper to 0.01, because the relationship of treated to potential comparison persons diminishes strongly.

5 Empirical results

Before matching, our base sample consists of roughly 10,000 persons taking up a subsidized and 170,000 persons taking up an unsubsidized job. In West Germany, around 3 percent of all hires in the sample were subsidized; more than 10 percent were subsidized in East Germany. The mean actual duration of subsidization amounted to 4 months in West Germany, to 5 months for men in East Germany and to 6 months for women in East Germany. We do not have individual information on the size of the subsidy, but information merged through cost accounting at the local level indicates that the average daily subsidy amounted to about 20 Euros, with average costs of subsidization around 2500 Euros in West Germany up to more than 3000 Euros for East German female workers.

Table A.1 in the Appendix presents mean values of the variables underlying the propensity score matching before the matching took place. Table A.1 shows that mean characteristics of workers taking up subsidized or unsubsidized employment, respectively, differ partly: i) Regarding socio-demographics, workers supported by a subsidy have over-proportionally received unemployment assistance than those who took up an unsubsidized job; differences are rather small regarding further features. ii) Looking at the job characteristics, more of those in subsidized jobs are occupied in a white collar job, less often in a manufacturing occupation. iii) Subsidized employment relationships are found comparatively more often in urban labor markets with high or medium unemployment as well as in rural areas with below average unemployment. iv) Rather strong

selectivity effects seem to exist on the firm's side. Subsidized employment can be found over-proportionally in small firms and in branches such as sales and data processing, R&D and other economic services, but it is under-represented particularly in the construction sector. Furthermore, subsidized workers are less often found in high wage firms. v) Turning to the individual labor market history, those who took up a subsidized job have participated more often in another labor market program during their previous unemployed spell and had been unemployed already longer than those who found a job without the help of a subsidy. Furthermore, during the years preceding their unemployment spell, they have spent less time in employment and more time in unemployment. Also, the share that had already participated in labor market programs and had experienced sickness periods is significantly higher. Taking all together, differences between subsidized and unsubsidized workers seems to be manifest themselves mainly in the labor market history of workers (less in their socio-demographic characteristics) and in the selection into smaller firms within particular branches.

How do wages of subsidized and unsubsidized workers differ before and after the propensity score matching took place? Table 2 presents the main results of the wage analysis. Let us first note that the mean standardized bias (MSB; given in the last rows of the Table) between the two groups of workers decreases considerably through matching, indicating a very good quality of the comparison group. Furthermore, as is usually found, wages are higher in West than in East Germany and higher for male than for female workers. To convey an impression of the unconditional wage distributions, Figure 1 shows kernel estimates of the distribution of daily starting wages for the four groups under consideration.

[Table 2, Figure 1, Figure 2]

Average daily starting wages are found in the first column of 1a) in Table 2. It is noteworthy that wage rates are rather low for our entire sample of previously unemployed individuals, and in particular for subsidized workers: Rhein & Stamm (2006) utilize the same data base underlying our wage information, the employment history files (BeH), to estimate the low-wage threshold for Germany, defined as two third of the median wage rate of all employment relationships observed at June 30. For the year 2003, the threshold amounted to a monthly wage rate of 1772 Euro in West and 1273 Euro in East Ger-

many. Assuming that a month has 30 days, this corresponded to a daily wage rate of 59 Euro in West and 42 Euro in East Germany. Thus in our sample, subsidized male workers in West Germany (62 Euro) are in average just above the low-wage threshold, while female workers (49 and 39 Euro, respectively) are generally found below, and only male workers in East Germany (51 Euro) earn in average considerably more.

Before matching, the mean starting daily wage after taking up the job (1a) is significantly lower across subsidized workers for all four groups investigated; the difference is around twice as large in West Germany (around 4 to 5 Euros) than in East Germany (around 2 Euros). Unconditional wage differences between subsidized and unsubsidized workers can, however, mostly be explained by the characteristics of the worker, the local labor market and the firm – after the matching took place, the differences in starting wages decline considerably and remain significant only for East German men. Results are similar, if we take a look at the mean daily wage during days of employment in the 3.5 years after taking up the job (1b). However, if we compute the mean daily wage across these 3.5 years, imputing zero wages for days without employment (1c), we find that subsidized workers in East Germany as well as male West German workers earn 2 to 4 Euros more per day than their unsubsidized counterparts after matching. The underlying reason is depicted in Figure 2: The share of subsidized workers in regular employment is usually higher during the observation period than the share of unsubsidized workers. In particular, during the first months in employment, subsidized employment relationships are more stable than unsubsidized ones (see also Ruppe 2009 and Jaenichen & Stephan 2009) and seem to be less subject to seasonal adjustments. A much higher share of unsubsidized than of subsidized workers takes up work in the construction sector, in hotels and restaurants, as well as in temporary help firms, where the expected duration of employment is rather short. While differences in employment shares are only partly significant in West Germany, they are quite substantial in East Germany.

In a next step, we compare the wage rates described above with appropriate "counterparts" that that workers had received before their unemployment spell, to cancel out unobserved time-constant unobserved individual heterogeneity among workers that might have remained after matching on observables. If we compare the starting wage with the last wage earned before unemployment (2a), we find that subsidized workers –

compared to all other newly hired workers – have experienced a significant larger mean gain in daily wages, ranging from about 1 to nearly 4 Euros in the four groups investigated. However, compared to the selected comparison group of unsubsidized workers, the difference vanishes and turns – while small – even significantly negative for male East German workers. Results for the matched sample are similar for mean daily wages of subsidized and similar unsubsidized workers, cumulated over longer periods (2b). Comparing mean wages over these time periods and imputing wages of zero for days without employment, we find a mean wage gain of subsidized compared to all unsubsidized workers (2c) of about 6 to 9 Euros. Again, restricting the comparison to the matched counterparts, differences remain mostly significant and amount to roughly 3 Euros.

Finally, Table 3 displays the results for an analysis restricted on individuals taking up a job in a firm that has hired at least one subsidized and one unsubsidized worker. This step intends to control also partly for unobserved firm heterogeneity, because it might be that only a strongly self-selected group of firms makes use of wage subsidies. As can be seen in the lower part of Table 3, the remaining number of observations is smaller and decreases to around 30 percent of the full sample for those subsidized and to around 4 percent for those not subsidized. Also the quality of the matching – as indicated by the mean standardized bias (MSB) – is poorer, but still in an acceptable range. Descriptive statistics for these selected groups of workers can be found also in Table A.1 in the Appendix. It indicates that – compared to the full sample – these firms employ an over-proportionally high share of unqualified blue collar workers, are quite often located in urban areas with medium unemployment, mostly employ between 10 and 249 employees and are often temporary help firms (West Germany) or in the construction sector (East Germany). Figure 3 displays the subsequent employment rates for subsidized and unsubsidized workers within the matched sample, which are again higher among subsidized workers.

[Table 3, Figure 3]

Table 3 shows that mean wages of newly hired workers are generally lower within this group of firms than in the full sample, and they are in particular lower for workers hired without a supporting subsidy. If we look at the results before matching, subsidized

workers experience significant positive wage gains (1a). Thus at a first glance, subsi-dized workers within these firms might be either a positive selection or pocket part of the subsidy. However, differences do not remain significant after the matching took place. This is also the case after matching, if we compute the mean daily wage when employed (1b), or if we look at wage differences to the previous job (2a, 2b). However, we find again wage gains of subsidized workers through the 3.5 years after taking-up the job, when we impute zero wages for days without regular employment.

For robustness checks, all estimates have also been conducted for individuals who did not enter any (other) labor market program during the unemployment spell. Results were very similar to those presented above. Furthermore, we separately repeated the estimates for subsidies due to training requirements and subsidies for hard-to-place workers. While we will not present the results in detail, some findings are noteworthy: As could have been expected, average daily wages are lower – by up to 10 Euro – for individuals receiving a subsidy for hard-to-place workers than for those receiving one for training requirements. While their average employment shares over time are also lower, the dif-ference in employment shares compared to a matched comparison group is higher, which indicates a higher effectiveness of the program for individuals with more severe obstacles to reintegration into the labor market. Regarding wage differences between subsidized and similar unsubsidized workers, we find again nearly no different signifi-cant differences after matching for both variants of the subsidy.

Finally, although this is not the main topic of our paper, a simple fiscal cost-benefit-analysis for subsidized workers is presented in Appendix B. This enables us to get a very rough impression of the efficiency of the subsidy. While the findings should be interpreted with care, they indicate that wage subsidies might be self-financing over the longer run if adverse indirect effects are not too large.

6   Summary and conclusions

For Germany, this paper investigates a sample of new hires during the second quarter of 2003 and asks how subsequent wages differ between workers, who took up a subsidized or unsubsidized job, respectively. Previous research for North America has indicated

that subsidized workers might participate in rent-sharing from subsidies, if firms can apply for tax credits when hiring eligible workers (Hamersma 2005). On the other hand, only low-wage workers had an incentive to utilize the wage subsidy, if vouchers were handed out directly to randomly selected workers (Dubin & Rivers 1993) or randomly selected workers had to become eligible and then qualify for a generous in-wage benefit (Brouillette & Lacroix 2008), thus the estimated impact on wages of actually subsidized workers was negative.

In Germany, the most important wage subsidy programs in the time period under consideration granted time-limited supplements to firms that hired hard-to-place workers or workers into jobs with particular training requirements. The size and duration of these subsidies were negotiated between caseworkers and firms. To present first results on the wages of workers supported by such a subsidy, we use a large process generated data set, providing information on individual, regional and firm characteristics as well as on wage rates received during a previous period. We compare their wages with those of unsubsidized workers. In a first step, to account as far as possible for observed heterogeneity, we selected a comparison group by means of a propensity score matching. In a second step, to cancel out time-constant individual heterogeneity, we combined this with a difference-in-differences approach, focusing on the wage development of individual workers before and after taking up the new job. Finally and in a third step, to consider also unobserved time-constant firm heterogeneity, we restricted the analysis to a sample of firms hiring subsidized as well as unsubsidized workers.

For the full sample, the findings show – as would have been expected – that mean wages of subsidized workers were significantly lower than those of the average hired person. However, after conducting a comparison with a group of unsubsidized workers, selected by means of propensity score matching, wage rates of both groups were mostly not significantly different. If we concentrate on individual wages changes compared to a previous period, the difference in individual wage changes between subsidized and unsubsidized workers with similar observed characteristics is mostly insignificant as well. However, it is noteworthy that initially subsidized workers have subsequently higher employment rates, resulting in significantly higher cumulated wages during the time frame investigated. If we aggregate these higher wages due to higher employment rates

over the observation period of 3.5 years, based on the estimates 1c) in Table 2, we end up with additional earnings of subsidized workers of 2,200 Euros (women in West Germany) up to 5,000 Euros (men in East Germany). Accordingly, a simple fiscal cost-benefit analysis based on this estimates indicates that the subsidy might pay out from a fiscal point of view in the longer run. It relies, however, on the assumption that subsequent higher employment shares are in fact the result of subsidization and that no large scale substitution and crowding-out effects occur. To take these indirect effects into account, an additional macro-level analysis would be required.

In a further step, we restricted the analysis to a sample of firms that hired unsubsidized as well as subsidized workers during the time period under investigation. Within this self-selected group of firms (often temporary help firms), starting wages of subsidized workers were in fact even higher than for the average newly hired unsubsidized worker, but the significance of the effect vanishes for the matched sample. Taking again a difference-in-differences approach, we also do not find significant wage differences. Subsequent employment rates of subsidized workers are also mostly higher within this sample of firms, inducing average wage gains over 3.5 years by way of higher employment rates.

How might the difference – mostly insignificant wage differences between subsidized and similar unsubsidized workers – to the North American studies cited above be explained? While the law prescribes that only wages up to the collectively negotiated or the local customary level, respectively, and up to social security thresholds could be taken into account, no explicit legal lower or upper bound on wages as such is given. While local labor market offices seem to refuse subsidies, if wages significantly undercut the local customary wage level, our main explanation is that the German system of wage setting is shaped by collective contracts and an attachment of wages to jobs rather than to individual abilities: The ubiquity of collective contracts implies that lower or higher wages for subsidized workers than for unsubsidized workers within similar jobs and within the same firm might first not be feasible (if the firm is covered by a collective contract and the worker is unionized) and second and even more important, be assessed as not acceptable or unfair, respectively, by workers, firms' management and also

by caseworkers. This should hold in particular regarding wage-undercutting because subsidized jobs are in average rather low-wage jobs.

To conclude, empirically observed wage effects of wage subsidies seem to hinge crucially on the design of subsidy scheme and on the institutional environment. For Germany, our study does not present evidence on rent-sharing between workers and firms to exploit the schemes under consideration. We find no hints on wage-cutting in subsidized jobs, too. Furthermore, subsidized jobs go hand in hand with subsequent higher employment shares and are of longer duration on average (see also Ruppe). Thus at least part of the subsidy could be reimbursed through higher taxes and social security contributions as well as lower expenditures for unemployment benefits and unemployment assistance in the longer run.

However, as has been mentioned already in the introduction, our analysis does not give causal evidence about the effectiveness of subsidies: The results do not preclude that those subsidized would not have been recruited at the same wage rate and with the same subsequent employment rates also in the absence of a subsidy, which would induce a deadweight loss. In Germany, it is mainly a careful assessment of individual placement difficulties regarding the particular job on the caseworker's side that could prevent such deadweight effects. Furthermore, the widespread use of subsidies – in particular in East Germany – might have an adverse impact on reservation wages of unemployed workers. Again, it is one of the difficult tasks of caseworkers to preclude such adverse incentive effects.

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Tables and Figures

Table 1:   Variables used for the propensity score matching

Variable group	Variables
i) Individual socio-demographic characteristics	Measured at the beginning of the unemployment spell: Marital status, nationality, age group, health problems, degree of disability, attained degree of schooling and education, recipient of unemployment benefits or assistance.
ii) Job characteristics	Blue or white collar worker, broad occupational classification, local rate of hiring to unemployment and local unemployment rate in the worker's occupation (three digit code)
iii) Local labor market characteristics	Performance cluster of the regional labor market (Blien et al. 2004)
iv) Firm characteristics	Firm size class, sectoral affiliation, mean daily wage in firm (three categories), mean share of workers with university degree (two categories).
v) Individual labor market history	Participation in an active labor market program during the unemployment spell (seven categories)
	Measured since the start of the unemployment spell: Duration until taking up the job.
	Measured at the start of the unemployment spell: Duration in employment (last three years) and duration in unemployment (last two years), participation in labor market programs (last two years), sanctioned through caseworker (last two years) and periods of illness (last two years).

Table 2: Full sample: Mean daily wages and wage differences over time for subsidized workers (S) and unsubsidized workers (U) and wage differences (Δ) before and after matching (standard deviations in parentheses)

	Full sample											
	Men West			Women West			Men East			Women East		
Matching	S	U	Δ	S	U	Δ	S	U	Δ	S	U	Δ
1a) Daily wage directly after taking-up the job												
Before	61.7	66.0	-4.3**	49.4	54.1	-4.7**	50.9	53.0	-2.0**	39.2	40.7	-1.5**
	(18.7)	(23.1)	(0.4)	(18.6)	(24.4)	(0.8)	(13.1)	(16.0)	(0.3)	(13.4)	(16.2)	(0.4)
After	61.8	62.1	-0.2	49.6	50.1	-0.5	51.0	52.1	-1.2**	39.3	40.0	-0.6
	(18.7)	(22.4)	(0.4)	(18.5)	(21.9)	(0.7)	(13.2)	(15.4)	(0.3)	(13.6)	(15.9)	(0.5)
1b) Mean daily wage when employed during the 3.5 years after taking-up the job												
Before	63.6	67.6	-4.1**	50.8	56.2	-5.3**	52.4	54.1	-1.7**	40.1	41.4	-1.3**
	(19.6)	(22.8)	(0.4)	(19.7)	(25.5)	(0.8)	(14.2)	(15.9)	(0.3)	(14.6)	(17.0)	(0.4)
After	63.8	63.9	-0.1	51.2	51.9	-0.7	52.5	53.3	-0.8**	40.3	40.8	-0.5
	(19.6)	(22.3)	(0.4)	(19.8)	(22.8)	(0.7)	(14.3)	(15.9)	(0.3)	(14.7)	(16.5)	(0.5)
1c) Mean daily wage during the 3.5 years after taking-up the job												
Before	44.7	47.1	-2.4**	36.3	39.9	-3.6**	38.2	36.1	2.1**	29.4	27.1	2.3**
	(27.9)	(30.0)	(0.5)	(24.5)	(29.4)	(0.9)	(20.4)	(21.7)	(0.4)	(18.2)	(20.3)	(0.5)
After	45.1	42.1	3.1**	37.0	35.3	1.7*	38.7	34.8	3.9**	29.9	26.6	3.3**
	(27.8)	(29.6)	(0.5)	(24.5)	(26.7)	(0.9)	(20.3)	(22.3)	(0.4)	(18.1)	(20.2)	(0.6)
2a) Difference 1a) and latest daily wage observed in the three years preceding the job												
Before	4.6	0.7	3.9**	4.8	2.7	2.2**	1.9	0.9	1.1**	5.8	3.1	2.7**
	(28.1)	(24.3)	(0.4)	(25.2)	(25.0)	(0.8)	(21.9)	(18.5)	(0.3)	(21.5)	(18.8)	(0.5)
After	4.5	3.7	0.8	4.6	5.0	-0.4	1.5	3.0	-1.5**	5.4	6.2	-0.8
	(28.0)	(27.8)	(0.5)	(25.3)	(26.7)	(0.9)	(21.7)	(20.8)	(0.4)	(21.1)	(21.8)	(0.6)
2b) Difference 1b) and mean daily wage when employed during the 3 years preceding the job												
Before	6.2	3.2	2.9**	6.9	6.3	0.6	4.2	3.3	0.9**	6.9	4.6	2.3**
	(26.1)	(21.3)	(0.4)	(24.3)	(23.6)	(0.7)	(19.2)	(16.0)	(0.3)	(20.7)	(18.0)	(0.5)
After	6.1	5.8	0.3	6.9	7.5	-0.6	3.9	5.0	-1.1**	6.4	7.5	-1.1
	(26.0)	(25.6)	(0.5)	(24.3)	(25.6)	(0.8)	(18.9)	(19.2)	(0.3)	(20.3)	(21.0)	(0.6)
2c) Difference 1c) and mean daily wage during the 3 years preceding the job												
Before	11.7	3.1	8.6**	11.2	5.6	5.7**	9.4	2.5	6.9**	12.4	5.0	7.4**
	(29.1)	(28.6)	(0.5)	(26.1)	(28.1)	(0.9)	(21.7)	(21.4)	(0.4)	(20.3)	(20.1)	(0.5)
After	11.8	8.6	3.2**	11.5	9.1	2.3**	9.4	5.7	3.7**	12.1	9.3	2.7**
	(29.0)	(29.5)	(0.6)	(26.1)	(27.0)	(0.9)	(21.6)	(22.6)	(0.4)	(20.3)	(21.3)	(0.6)
	Observations	MSB		Observations	MSB		Observations	MSB		Observations	MSB	
Before	3130	87119	12.4	1039	31201	12.2	3969	37639	9.6	1672	10866	11.6
After	3060	86914	0.8	998	30488	1.0	3823	37003	0.5	1522	9926	1.2

*) Significant at α = 0.05. **) Significant at α = 0.01.
Note: Workers taking up a full-time job during the second quarter of 2003. Comparison persons have been selected by means of a radius matching and a caliper of 0.0005. Subsidies include subsidies due to training requirements as well as subsidies for hard-to-place workers. With the exception of the first subsidized employment spell, only times in unsubsidized employment are considered.

Table 3: Only firms hiring subsidized and unsubsidized workers: Mean daily wages and wage differences over time for subsidized workers (S) and unsubsidized workers (U) and wage difference (Δ) before and after matching (standard deviations in parentheses)

	Only firms hiring subsidized and unsubsidized workers											
	Men West			Women West			Men East			Women East		
Matching	S	U	Δ	S	U	Δ	S	U	Δ	S	U	Δ
1a) Daily wage directly after taking-up the job												
Before	58.7	54.9	3.8**	49.7	44.6	5.1**	51.8	49.0	2.8**	39.9	38.0	1.9*
	(19.5)	(20.5)	(0.8)	(17.5)	(17.2)	(1.3)	(13.6)	(14.5)	(0.5)	(13.1)	(12.8)	(0.8)
After	58.6	57.7	0.9	49.9	47.4	2.5	51.8	51.0	0.8	39.8	39.8	0.0
	(19.3)	(20.4)	(1.0)	(17.5)	(18.4)	(1.9)	(13.6)	(13.9)	(0.6)	(13.2)	(12.2)	(1.1)
1b) Mean daily wage when employed during the 3.5 years after taking-up the job												
Before	60.8	59.1	1.7*	52.5	48.4	4.1**	53.4	51.3	2.0**	41.5	40.0	1.6
	(19.4)	(20.7)	(0.8)	(18.7)	(18.5)	(1.4)	(14.5)	(14.7)	(0.5)	(14.0)	(14.0)	(0.9)
After	60.8	60.2	0.6	52.8	50.1	2.7	53.4	52.6	0.8	41.4	41.2	0.2
	(19.3)	(20.4)	(1.0)	(18.7)	(19.5)	(2.0)	(14.5)	(14.3)	(0.6)	(13.9)	(13.5)	(1.2)
1c) Mean daily wage during the 3.5 years after taking-up the job												
Before	41.5	39.8	1.7	37.7	30.8	6.9**	38.0	34.5	3.5**	30.8	27.3	3.5**
	(26.8)	(28.1)	(1.1)	(24.1)	(24.1)	(1.8)	(21.3)	(20.7)	(0.7)	(18.0)	(18.6)	(1.1)
After	41.6	38.6	3.0*	38.2	30.1	8.1**	38.2	34.1	4.1**	30.9	27.7	3.1*
	(26.7)	(28.6)	(1.3)	(24.3)	(24.4)	(2.6)	(21.1)	(20.8)	(0.8)	(17.7)	(19.1)	(1.5)
2a) Difference 1a) and latest daily wage observed in the three years preceding the job												
Before	4.9	-3.2	8.1**	5.0	-1.4	6.4**	2.9	-0.8	3.7**	6.9	1.2	5.8**
	(27.9)	(24.1)	(1.0)	(26.2)	(23.8)	(1.8)	(21.3)	(18.4)	(0.7)	(21.9)	(17.8)	(1.2)
After	4.4	2.9	1.5	4.0	1.9	2.1	2.7	1.5	1.1	6.1	6.2	-0.1
	(27.6)	(27.1)	(1.3)	(26.1)	(25.7)	(2.7)	(21.2)	(20.0)	(0.8)	(21.3)	(21.3)	(1.6)
2b) Difference 1b) and mean daily wage when employed during the 3 years preceding the job.												
Before	5.5	0.8	4.7**	8.2	2.9	5.3**	4.5	2.3	2.3**	8.2	3.7	4.5**
	(25.6)	(21.3)	(0.9)	(25.5)	(20.1)	(1.6)	(18.8)	(16.0)	(0.6)	(21.3)	(16.8)	(1.2)
After	5.1	5.7	-0.6	7.3	6.1	1.2	4.4	4.0	0.5	7.4	8.4	-1.0
	(25.2)	(25.6)	(1.1)	(25.3)	(21.4)	(2.4)	(18.6)	(17.7)	(0.7)	(20.5)	(19.4)	(1.5)
2c) Difference 1c) and mean daily wage during the 3 years preceding the job												
Before	10.7	1.7	9.0**	13.2	1.4	11.8**	9.4	3.0	6.4**	14.4	5.0	9.4**
	(27.9)	(26.7)	(1.0)	(27.1)	(24.3)	(1.8)	(21.7)	(20.9)	(0.7)	(21.3)	(19.1)	(1.2)
After	10.5	8.1	2.4	12.5	5.7	6.7*	9.3	5.5	3.8**	13.9	10.4	3.5*
	(27.5)	(28.7)	(1.3)	(26.9)	(26.4)	(2.7)	(21.6)	(21.3)	(0.9)	(21.0)	(19.9)	(1.6)
	Observations		MSB	Observations		MSB	Observations		MSB	Observations		MSB
Before	953	2277	10.5	253	681	13.5	1274	2397	8.9	414	672	12.9
After	932	2277	2.6	227	670	4.6	1236	2383	1.4	382	610	3.7

*) Significant at α = 0.05. **) Significant at α = 0.01.
Note: Workers taking up a full-time job during the second quarter of 2003. Comparison persons have been selected by means of a radius matching and a caliper of 0.01. Subsidies include subsidies due to training requirements as well as subsidies for hard-to-place workers. With the exception of the first subsidized employment spell, only times in unsubsidized employment are considered.

Figure 1:   Full sample: Kernel estimates of the distributions of daily wages directly after taking up the job
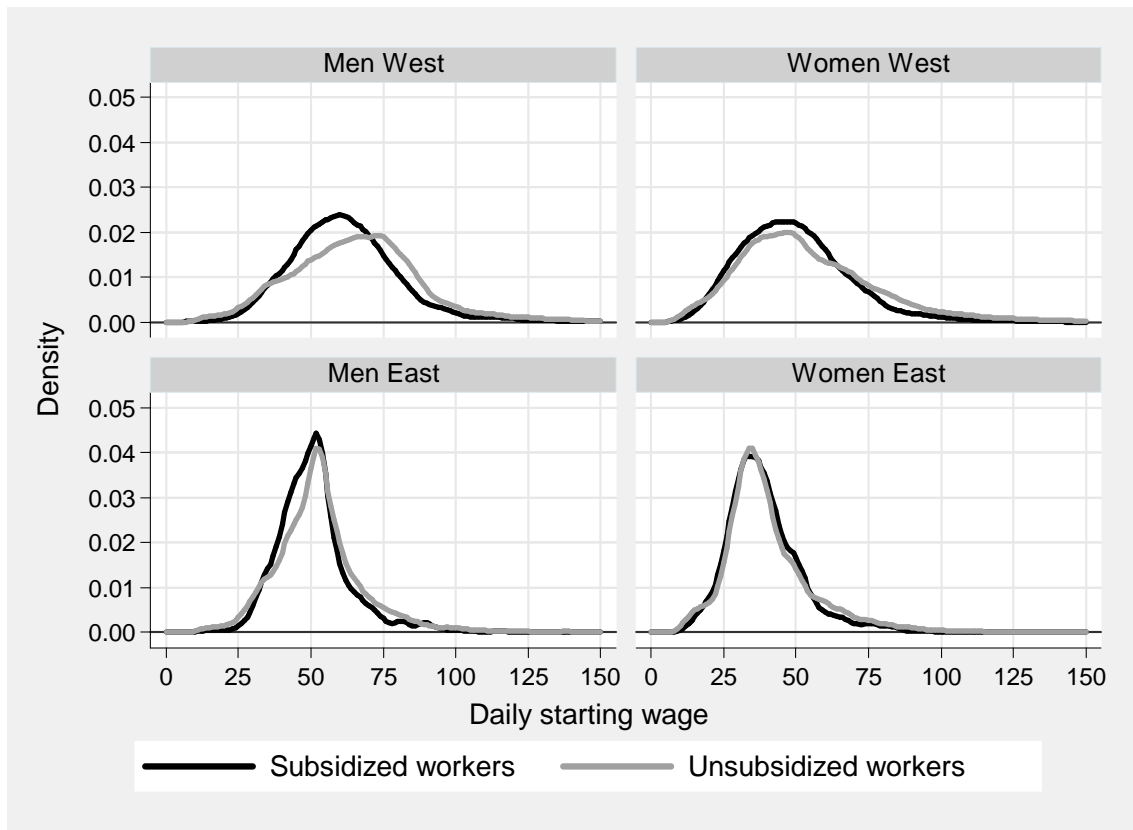
Note: Workers taking up a full-time job during the second quarter of 2003. Subsidies include subsidies due to training requirements as well as subsidies for hard-to-place workers.

Figure 2: Full sample: Share of subsidized workers and matched comparison persons in employment as well as difference in shares

Note: Workers taking up a full-time job during the second quarter of 2003. Confidence intervals for the difference in shares are given for α = 0.05. Comparison persons have been selected by means of a radius matching and a caliper of 0.0005. Subsidies include subsidies due to training requirements as well as subsidies for hard-to-place workers. With the exception of the first subsidized employment spell, only times in unsubsidized employment are considered.

Figure 3: Only firms hiring subsidized and unsubsidized workers: Share of subsidized workers and matched comparison persons in employment as well as difference in shares

Note: Workers taking up a full-time job during the second quarter of 2003. Confidence intervals for the difference in shares are given for $\alpha = 0.05$. Comparison persons have been selected by means of a radius matching and a caliper of 0.01. Subsidies include subsidies due to training requirements as well as subsidies for hard-to-place workers. With the exception of the first subsidized employment spell, only times in unsubsidized employment are considered.

Table A.1:   Variable means for subsidized workers (S) and unsubsidized workers (U) before matching

| | Full sample | | | | | | | | Only firms hiring subsidized and unsubsidized workers | | | | | | | |
| | Men West | | Women West | | Men East | | Women East | | Men West | | Women West | | Men East | | Women East | |
	S	U	S	U	S	U	S	U	S	U	S	U	S	U	S	U
Married	0.48	0.50	0.39	0.41	0.49	0.49	0.59	0.57	0.49	0.46	0.36	0.42	0.49	0.48	0.60	0.57
Foreigner	0.13	0.16	0.06	0.10	0.01	0.02	0.01	0.01	0.14	0.14	0.07	0.09	0.01	0.01	0.01	0.01
Age 25-29	0.24	0.24	0.20	0.24	0.21	0.19	0.15	0.17	0.23	0.27	0.19	0.24	0.21	0.19	0.15	0.15
Age 30-34	0.23	0.24	0.21	0.21	0.21	0.19	0.21	0.18	0.24	0.24	0.23	0.20	0.20	0.19	0.23	0.19
Age 35-39	0.21	0.22	0.23	0.22	0.21	0.22	0.26	0.22	0.20	0.21	0.25	0.21	0.20	0.21	0.29	0.23
Age 40-44	0.19	0.18	0.21	0.19	0.21	0.22	0.23	0.23	0.20	0.17	0.17	0.21	0.22	0.22	0.20	0.25
Age 45-49	0.13	0.12	0.16	0.14	0.16	0.18	0.15	0.19	0.13	0.12	0.16	0.14	0.18	0.19	0.14	0.17
Health problems	0.08	0.05	0.06	0.04	0.03	0.03	0.03	0.04	0.07	0.06	0.04	0.05	0.03	0.04	0.02	0.04
Slightly disabled	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.02	0.00	0.00	0.01	0.00	0.01
Severely disabled	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.02	0.00	0.01	0.00	0.01
No secondary degree	0.11	0.11	0.05	0.06	0.03	0.04	0.01	0.02	0.12	0.11	0.05	0.08	0.03	0.05	0.01	0.03
Secondary degree (Hauptschule)	0.55	0.60	0.36	0.39	0.21	0.24	0.10	0.14	0.59	0.59	0.40	0.41	0.23	0.25	0.13	0.18
Secondary degree (Realschule)	0.20	0.18	0.38	0.33	0.69	0.67	0.76	0.73	0.18	0.21	0.34	0.35	0.69	0.66	0.78	0.73
Secondary degree (Gymnasium)	0.13	0.11	0.22	0.22	0.07	0.05	0.12	0.10	0.11	0.09	0.21	0.16	0.05	0.05	0.08	0.06
No vocational training	0.31	0.30	0.20	0.26	0.05	0.07	0.05	0.08	0.34	0.33	0.23	0.35	0.06	0.06	0.06	0.09
Vocational training	0.64	0.66	0.73	0.66	0.91	0.91	0.89	0.87	0.62	0.64	0.72	0.60	0.92	0.92	0.90	0.88
University degree	0.05	0.04	0.07	0.08	0.03	0.02	0.06	0.05	0.04	0.03	0.06	0.04	0.02	0.02	0.04	0.03
Unemployment benefits receipt	0.53	0.70	0.60	0.71	0.59	0.72	0.49	0.72	0.49	0.62	0.59	0.63	0.58	0.68	0.50	0.70
Unemployment assistance receipt	0.21	0.07	0.15	0.05	0.21	0.10	0.28	0.13	0.23	0.10	0.16	0.09	0.21	0.14	0.29	0.17
No benefit receipt	0.27	0.23	0.25	0.24	0.20	0.18	0.23	0.15	0.28	0.28	0.25	0.28	0.21	0.18	0.21	0.14
Unqualified blue collar worker	0.45	0.45	0.19	0.33	0.23	0.28	0.18	0.28	0.52	0.56	0.32	0.49	0.27	0.31	0.26	0.42
Qualified blue collar worker	0.34	0.40	0.10	0.10	0.66	0.65	0.27	0.32	0.32	0.33	0.11	0.07	0.65	0.64	0.27	0.31
White collar worker	0.21	0.16	0.70	0.57	0.12	0.07	0.55	0.40	0.15	0.10	0.57	0.44	0.08	0.05	0.47	0.27
Agrarian or mining occupation	0.02	0.01	0.01	0.01	0.01	0.01	0.04	0.05	0.03	0.02	0.02	0.01	0.01	0.02	0.04	0.06
Manufacturing occupation	0.57	0.62	0.16	0.18	0.72	0.76	0.14	0.20	0.60	0.61	0.23	0.30	0.75	0.73	0.16	0.26
Technical occupation	0.06	0.04	0.04	0.03	0.04	0.03	0.06	0.04	0.05	0.03	0.04	0.03	0.04	0.03	0.06	0.03
Service occupation	0.35	0.33	0.78	0.78	0.22	0.20	0.75	0.71	0.32	0.34	0.72	0.66	0.20	0.22	0.74	0.66
Local rate hirings/unemployment in 3-digit-occ.	1.67	2.03	2.16	2.55	0.88	0.91	0.87	1.02	1.62	1.69	2.00	2.00	0.87	0.89	0.90	0.83
Local unemployment rate in 3-digit-occupation	0.20	0.20	0.15	0.16	0.33	0.34	0.28	0.30	0.21	0.21	0.16	0.19	0.34	0.33	0.29	0.32

Row group labels (left margin): i) Individual socio-demographic characteristics (Married through No benefit receipt); ii) Job characteristics (Unqualified blue collar worker through Local unemployment rate in 3-digit-occupation).

Table A.1 continued: Variable means for subsidized workers (S) and unsubsidized workers (U) before matching

| | | Full sample | | | | | | | | Only firms hiring subsidized and unsubsidized workers | | | | | | | |
| | | Men West | | Women West | | Men East | | Women East | | Men West | | Women West | | Men East | | Women East | |
		S	U	S	U	S	U	S	U	S	U	S	U	S	U	S	U
iii) Local lobor market characteristics	East Germany, worst situation	-	-	-	-	0.16	0.15	0.16	0.12	-	-	-	-	0.17	0.15	0.16	0.11
	East Germany, bad situation	-	-	-	-	0.68	0.66	0.63	0.66	-	-	-	-	0.67	0.65	0.58	0.60
	East Germany, high unemployment	-	-	-	-	0.14	0.17	0.19	0.19	-	-	-	-	0.15	0.18	0.24	0.27
	Urban area, high unemployment	0.09	0.08	0.11	0.08	0.02	0.02	0.02	0.03	0.11	0.10	0.10	0.07	0.02	0.02	0.02	0.01
	Urban area, medium unemployment	0.18	0.13	0.18	0.15	-	-	-	-	0.20	0.21	0.16	0.21	-	-	-	-
	Above average unemp., moderate dynamics	0.13	0.10	0.12	0.10	-	-	-	-	0.16	0.15	0.10	0.12	-	-	-	-
	Rural area, average unemployment	0.11	0.09	0.10	0.08	-	-	-	-	0.09	0.09	0.13	0.13	-	-	-	-
	Rural area, below average unemployment	0.24	0.20	0.23	0.18	-	-	-	-	0.22	0.23	0.25	0.24	-	-	-	-
	Center, good situation and high dynamics	0.06	0.10	0.07	0.13	-	-	-	-	0.06	0.06	0.05	0.06	-	-	-	-
	Rural area, good situation and high dynamics	0.04	0.08	0.03	0.05	-	-	-	-	0.05	0.04	0.03	0.03	-	-	-	-
	Small-business dominated, good situation	0.08	0.13	0.08	0.15	-	-	-	-	0.06	0.08	0.09	0.07	-	-	-	-
	Very good situation	0.06	0.09	0.09	0.09	-	-	-	-	0.05	0.06	0.10	0.06	-	-	-	-
iv) Firm characteristics	Firm size < 10	0.44	0.32	0.49	0.31	0.41	0.34	0.50	0.40	0.15	0.08	0.12	0.04	0.17	0.11	0.21	0.10
	Firm size 10-49	0.34	0.35	0.32	0.30	0.40	0.39	0.31	0.31	0.38	0.29	0.40	0.21	0.48	0.40	0.32	0.27
	Firm size 50-249	0.19	0.24	0.16	0.27	0.17	0.22	0.16	0.22	0.39	0.51	0.37	0.56	0.29	0.37	0.37	0.47
	Firm size 250-499	0.02	0.04	0.02	0.05	0.01	0.03	0.01	0.04	0.04	0.04	0.06	0.12	0.03	0.03	0.03	0.04
	Firm size > 500	0.01	0.05	0.01	0.07	0.01	0.02	0.02	0.03	0.03	0.07	0.06	0.07	0.04	0.08	0.07	0.11
	Manufacturing sector	0.22	0.19	0.15	0.17	0.21	0.13	0.21	0.15	0.19	0.12	0.17	0.17	0.21	0.15	0.29	0.24
	Construction sector	0.18	0.29	0.05	0.03	0.33	0.42	0.05	0.05	0.16	0.12	0.07	0.01	0.35	0.30	0.06	0.04
	Sales sector	0.19	0.11	0.22	0.16	0.13	0.07	0.20	0.13	0.12	0.06	0.14	0.13	0.07	0.06	0.14	0.09
	Hotels and restaurants	0.02	0.05	0.06	0.12	0.03	0.03	0.14	0.27	0.01	0.01	0.04	0.02	0.01	0.01	0.13	0.15
	Transport, storage and communication sector	0.11	0.09	0.03	0.03	0.11	0.09	0.04	0.03	0.10	0.08	0.03	0.03	0.11	0.10	0.06	0.03
	Financial intermediation sector	0.00	0.00	0.02	0.01	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Real estate activities	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.01
	Temporay help firms and personal services	0.10	0.14	0.09	0.12	0.05	0.14	0.03	0.07	0.31	0.52	0.30	0.52	0.12	0.26	0.09	0.18
	Data processing, R&D and other economic services	0.12	0.08	0.17	0.13	0.09	0.07	0.14	0.11	0.08	0.07	0.09	0.05	0.09	0.09	0.11	0.13
	Health and social work services	0.02	0.02	0.14	0.14	0.01	0.01	0.12	0.09	0.01	0.01	0.11	0.06	0.01	0.00	0.08	0.06
	Private household services	0.02	0.03	0.06	0.07	0.02	0.02	0.04	0.07	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.08
	Mean daily wage in firm < 45 Euro	0.28	0.25	0.40	0.35	0.38	0.35	0.65	0.65	0.26	0.32	0.28	0.36	0.32	0.40	0.58	0.68
	Mean daily wage in firm 45-74 Euro	0.52	0.47	0.46	0.43	0.57	0.56	0.32	0.30	0.55	0.54	0.59	0.58	0.62	0.56	0.39	0.29
	Mean daily wage in firm >= 75 Euro	0.20	0.28	0.15	0.22	0.05	0.08	0.03	0.05	0.19	0.14	0.13	0.06	0.06	0.04	0.02	0.02
	Firm's share with university degree >= 0.1	0.07	0.07	0.10	0.15	0.10	0.07	0.12	0.11	0.04	0.04	0.08	0.06	0.08	0.08	0.07	0.07

Table A.1 continued: Variable means for subsidized workers (S) and unsubsidized workers (U) before matching

| | Full sample | | | | | | | | Only firms hiring subsidized and unsubsidized workers | | | | | | | |
| | Men West | | Women West | | Men East | | Women East | | Men West | | Women West | | Men East | | Women East | |
	S	U	S	U	S	U	S	U	S	U	S	U	S	U	S	U
During current unemp.: Start-up subsidy	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00
During current unemp.: Wage subsidy	0.01	0.00	0.01	0.00	0.02	0.00	0.02	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.02	0.00
During current unemp.: Further vocational training	0.02	0.01	0.04	0.01	0.04	0.01	0.03	0.01	0.03	0.01	0.04	0.01	0.03	0.02	0.04	0.01
During current unemp.: Short training within firm*	0.05	0.05	0.05	0.04	0.06	0.07	0.06	0.06	0.04	0.06	0.04	0.05	0.06	0.11	0.07	0.09
During current unemp.: Short classroom training	0.14	0.06	0.15	0.08	0.12	0.06	0.17	0.07	0.15	0.07	0.15	0.09	0.14	0.08	0.19	0.13
During current unemp.: Public job creation scheme	0.01	0.00	0.01	0.00	0.02	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.02	0.01	0.02	0.00
During current unemp.: Other program	0.02	0.00	0.02	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.03	0.00	0.02	0.00	0.02	0.00
Job entry during month 1 of unmployment	0.06	0.10	0.08	0.13	0.06	0.06	0.08	0.07	0.05	0.12	0.09	0.12	0.07	0.08	0.08	0.09
Job entry during month 2-3 of unemployment	0.14	0.21	0.13	0.25	0.16	0.17	0.18	0.17	0.14	0.23	0.10	0.27	0.14	0.19	0.16	0.19
Job entry during month 4-6 of unemployment	0.29	0.43	0.27	0.33	0.36	0.50	0.29	0.37	0.28	0.36	0.28	0.31	0.38	0.45	0.28	0.37
Job entry during month 7-9 of unemployment	0.27	0.18	0.25	0.18	0.24	0.18	0.23	0.26	0.27	0.18	0.23	0.18	0.25	0.19	0.22	0.23
Job entry during month 10-12 of unemployment	0.24	0.08	0.26	0.10	0.18	0.08	0.22	0.13	0.26	0.10	0.29	0.12	0.16	0.08	0.26	0.12
3 years before unemp.: Employed up to 1 month	0.12	0.04	0.15	0.07	0.09	0.04	0.21	0.10	0.12	0.06	0.14	0.06	0.07	0.05	0.21	0.11
3 years before unemp.: Employed 1-6 months	0.08	0.04	0.07	0.04	0.06	0.04	0.11	0.06	0.10	0.05	0.07	0.04	0.06	0.05	0.11	0.05
3 years before unemp.: Employed 7-12 months	0.11	0.07	0.10	0.07	0.11	0.07	0.13	0.10	0.12	0.08	0.13	0.10	0.12	0.08	0.11	0.10
3 years before unemp.: Employed 13-18 months	0.17	0.11	0.17	0.12	0.16	0.12	0.18	0.15	0.16	0.14	0.17	0.16	0.18	0.13	0.20	0.16
3 years before unemp.: Employed 19-24 months	0.15	0.18	0.13	0.15	0.17	0.19	0.10	0.19	0.14	0.18	0.13	0.15	0.18	0.19	0.12	0.17
3 years before unemp.: Employed 25-30 months	0.22	0.27	0.24	0.23	0.21	0.28	0.14	0.20	0.24	0.23	0.25	0.21	0.20	0.24	0.14	0.21
3 years before unemp.: Employed 30-36 months	0.15	0.29	0.14	0.32	0.20	0.26	0.13	0.20	0.12	0.26	0.11	0.27	0.19	0.26	0.11	0.21
2 years before unemp.: Unemployed up to 1 month	0.44	0.49	0.51	0.61	0.38	0.37	0.40	0.41	0.41	0.47	0.49	0.55	0.34	0.38	0.33	0.43
2 years before unemp.: Unemployed 1-6 months	0.19	0.25	0.17	0.20	0.22	0.29	0.16	0.19	0.21	0.26	0.18	0.21	0.23	0.29	0.19	0.21
2 years before unemp.: Unemployed 7-12 months	0.18	0.19	0.17	0.13	0.22	0.24	0.19	0.25	0.18	0.18	0.19	0.16	0.24	0.21	0.21	0.19
2 years before unemp.: Unemployed 13-18 months	0.11	0.05	0.09	0.04	0.13	0.07	0.14	0.11	0.12	0.07	0.06	0.06	0.14	0.09	0.15	0.11
2 years before unemp.: Unemployed 19-24 months	0.08	0.02	0.05	0.02	0.06	0.03	0.11	0.04	0.08	0.02	0.08	0.02	0.06	0.03	0.12	0.05
2 years before unemp.: Participation in program	0.33	0.14	0.32	0.15	0.39	0.24	0.50	0.30	0.35	0.20	0.33	0.20	0.40	0.29	0.54	0.33
2 years before unemp.: Periods of sickness	0.10	0.06	0.10	0.05	0.13	0.10	0.16	0.12	0.11	0.06	0.09	0.07	0.14	0.09	0.17	0.13
2 years before unemp.: Sanctioned	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.03	0.02	0.01	0.00	0.01	0.00	0.01	0.01
Number of observations	3130	87119	1039	31201	3969	37639	1672	10866	953	2277	253	681	1274	2397	414	672

The rows from "Job entry during month 1..." through "3 years before unemp.: Employed 30-36 months" are grouped under the side label: *v) Individual labor market history*

*) Only program participations in short-firm internal training that took place more than one month before taking-up the job.

Note: Excepted local rates for the 3-digit-occupation, all variables are categorized as dummy variables.

Appendix B: Fiscal cost-benefit analysis

The following cost-benefit analysis has to be taken with care: On the one hand we compare workers taking up subsidized and unsubsidized jobs and thus implicitly assume that the subsidy has not been necessary for hiring, which may underestimate the benefits of the subsidy. One the other hand we have to assume that the higher employment shares of previously subsidized workers are in fact a causal result of subsidization, which may overestimate the benefits. Furthermore, the analysis does not take into account possible indirect effects as substitution and crowding-out of previously unsubsidized workers through previously subsidized workers as well. The latter effects, however, do not necessarily have to occur; in the absence of subsidization subsequent mismatch might just have been larger.

We estimate the fiscal net effect for previously subsidized workers by deducting the estimated amount of the subsidy from estimated savings in unemployment benefits and unemployment assistance as well as estimated additional social security contribution and taxes during our observation period of 3.5 years (assuming an interest rate of zero). We do not have individual information on the size of the subsidy, but information merged through cost accounting at the local level indicates that the average daily subsidy amounted to about 20 Euros, with average costs of subsidization around 2500 Euros in West Germany up to more than 3000 Euros for East German female workers. Mean savings in unemployment benefit and unemployment assistance are computed from individual daily benefits during the unemployment spell preceding the analyzed hiring. Fiscal savings and additional incomes are computed on the base of gains in mean daily wages (1c) and mean daily wage differences (2c) from Table 2 and 3. Similar to Pfeiffer & Winterhager (2005), we assume that social security contributions and taxes constitute in average 50 percent of additional earnings.

As a result, Table B.1 shows that – independent from the underlying estimates of savings and additional incomes – estimated fiscal gains amount to 1600 to 2000 Euros for men in East Germany and to 500 to 1000 Euros for men in West Germany and women in East Germany. Estimates vary, however, strongly for female workers in West Germany, depending on the underlying specification.

Table B.1: Fiscal cost-benefit analysis of subsidized work for the 3.5 year period since taking up the job (mean values)

| | Full sample | | | | Only firms hiring subsidized and unsubsidized workers | | | |
| | West | | East | | West | | East | |
	Men	Women	Men	Women	Men	Women	Men	Women
Duration of the subsidy in days	124	127	151	173	117	118	142	162
Daily rate of subsidization	20	20	16	17	20	19	16	17
A) Amount of the subsidy	2512	2536	2631	3124	2360	2258	2463	2906
Daily unemployment benefit/assistance	20	16	18	14	19	16	18	15
Additional days in employment	70	63	115	130	73	157	88	112
B) Savings in unemployment benefits/assistance	1381	995	2107	1810	1380	2514	1595	1627
Additional wage per day (1c)	3	2	4	3	3	8	4	3
Additional earnings over 3.5 years	3923	2199	4951	4175	3873	10352	5234	4012
C1) Additional social sec. contributions/taxes	1962	1099	2476	2087	1936	5176	2617	2006
Additional wage difference per day (2c)	3	2	4	3	2	7	4	3
Additional income difference	4084	2993	4687	3480	3034	8604	4910	4438
C2) Additional social sec. contributions/taxes	2042	1496	2344	1740	1517	4302	2455	2219
A–B–C1 = Fiscal net effect in Euro based on 1c)	830	-442	1951	773	956	5432	1749	727
A–B–C2 = Fiscal net effect in Euro based on 2c)	911	-45	1819	426	537	4558	1587	940

Note: The analysis is based on the results from Table 2 and 3. Daily subsidy rates are estimated from cost accounting at the local level. Savings in unemployment benefit and unemployment assistance are computed from individual daily rates received at the beginning of the unemployment spell. Social security contributions (employee and employer) and taxes are estimated to account in average for 50 percent of additional incomes. The fiscal net effect is given by: Amount of the subsidy – savings in unemployment benefits and assistance – additional social security contribution and taxes.