Macro-Evaluation of Active Labour Market Policies in West and East Germany. An Extension of the Theory and empirical Evidence

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Abstract

This paper concentrates on the regional effects of various active labour-market programmes in Germany. Many existing papers have analysed the effects on a micro level, i.e. has a particular instrument increased the employment probability of a participant relative to that of a similar non-participant. However, to assess the effects on overall unemployment, it is important to analyse the regional effects of the instruments and control for displacement and substitution effects as well as deadweight losses. Hence, this paper evaluates the most important instruments on a regional level.

Most of the macroeconomic evaluation studies in this context use an extended version of the search model as described in Pissarides (2000) to prove the theoretical background for their empirical analyses. We further augment this model to adequately take into account the differences between those job-seekers who have participated (or are about to) in a policy measure and those who have not. These two groups differ in their search intensities and productivities.

From this extended theoretical model it is by no means clear whether an increase in the number of programme participants leads to higher outflows from unemployment into regular employment or not. Hence, we test the model by estimating an augmented matching function. By using the rich administrative data set from the Federal Employment Agency we are able to distinguish three groups of job-seekers: current programme participants, former programme participants and the remaining registered unemployed. Due to the large labour market disparities between eastern and western Germany, we examine the regional effects of active labour-market policy separately for the 35 local employment offices in eastern Germany and the 141 local employment offices in western Germany using quarterly panel data from January 2002 until December 2004.

The empirical evidence gives some tentative support to the view that the number of participants in a region has a negative effect on new matches due to lower search intensity and that the number of former participants in a region has a positive effect — maybe due to a higher productivity compared to the remaining registered unemployed. The effects of active labour-market programmes differ not only between different types of programmes but also for eastern and western Germany.

Keywords: Active labour-market programmes; evaluation; unemployment; search theory; panel estimation

JEL-Classification: C23; H43; J64; J68

1 Introduction

The persistently high unemployment rates in Germany in recent years – in spite of a very high amount of expenditures spent on active labour-market policies (ALMP) – led to the set up of the so-called *Hartz*-Commission. The primary aim of this commission was to improve the efficiency of the labour market particularly with respect to the placement of the unemployed. Many of the recommendations were put into practice in a series of four so-called *Hartz reforms* which started in 2002 and ended on January 1st 2005. In perhaps one of the largest set of labour-market reforms in Germany, both new active labour-market policies were introduced as well as existing instruments considerably modified. It was an explicit aim of the reforms that they be analysed with respect to their labour-market effects.

To this extent, many papers have analysed the effects of policy instruments on a micro level, i.e. has a particular instrument increased the employment probability or employment duration of a participant relative to that of a "similar" non-participant (see e.g. (Lechner and Wunsch, 2007)). However, one important aim of ALMP is also to decrease *overall* unemployment, not just that of participants. Therefore, it is important to analyse the macroeconomic effects of the instruments and control for displacement and substitution effects as well as deadweight losses.

Within Germany there are different labour-market conditions between eastern and western Germany. For example, the average unemployment rate in 2004 was 9.4 percent in western and 20.1 percent in eastern Germany. As a consequence, the mix of labour-market programmes differs considerably between both parts of Germany. Hence it is necessary to examine the regional effects of active labour-market policy separately for eastern and western Germany. In addition, this procedure makes it possible to compare the impact of active labour-market programmes among different labour-market conditions. Further, as the labour-market performance varies substantially not only between but also within eastern and western Germany, it is important to adequately consider regional aspects of the labour market. Hence, this paper evaluates the most important instruments (in terms of the number of participants) on a regional level by analysing the policy effects separately in the districts of the 35 eastern German and the 141 western German local employment offices (*Arbeitsagenturen*) separately for eastern and western Germany.[1]

Broadly speaking, there are two main ways of analysing these effects from a macroeconomic perspective: First, a commonly used model for general-equilibrium analyses is the one developed by Layard et al. (2005) where the primary cause of unemployment are wage

[1] Currently, there are in fact 37 local employment offices in eastern Germany. However, as the definition of the district borders in Berlin have changed recently, it is not possible to obtain consistent data at the required level for Berlin. Therefore, the employment offices in Berlin are treated as only one unit.

distortions (due to e.g. union wage bargaining or efficiency wages). A second method is to use the search model as described in Pissarides (2000) to provide the theoretical background for the empirical analyses. This model is especially suitable if the primary cause of unemployment seems to be a mismatch problem, e.g. the qualifications or regions of job-seekers and firms looking to fill their vacancies do not match. Seeing as one of the primary aims both of the *Hartz*-Commission as well as of ALMP is to bring people with labour-market difficulties back into work more quickly than would otherwise be the case, our analysis is based on the search model.

The majority of studies which have evaluated specific labour-market instruments have used (micro) matching techniques to compare the "treatment effect" of the treated (i.e. programme participants) with the labour-market performance of "statistical twins" – see e.g. Lechner and Wunsch (2007); Fitzenberger et al. (2007) amongst others. Some of the most important macroeconomic studies for Germany have been by Hagen (2004), Hujer and Zeiss (2006, 2003) and most recently by Hujer et al. (2007). They find insignificant effects for training measures or further vocational training measures and significant negative effects for job-creation schemes. However, they restrict their analyses either on western (Hujer and Zeiss (2006, 2003); Hujer et al. (2007)) or eastern Germany (Hagen (2004)). Because they use different methods and data, a direct comparison of the effects is not possible. In our case we are able to make this comparison by using the same method and dataset for eastern and western Germany. To the best of our knowledge, there are only the studies by Fertig et al. (2006) and Fertig et al. (2007) which also compare the macroeconomic effects of ALMP between eastern and western Germany. They find that the effects of some measures (e.g. job-creation schemes) differ between the eastern and the western part.

Our paper differs with respect to the mentioned studies both in our theoretical foundation and in the data we use. In our case the dataset is much more differentiated in its time structure. This is important for us as in the theoretical model which we want to empirically test, we explicitly differentiate between unemployed who are about to participate in a programme in the near future, those who have recently completed a programme and those unemployed who are neither destined to nor have just taken part in a labour-market measure. Further, the mentioned studies do not differentiate between participants and former participants and hence find mostly non-significant effects for the programmes they consider.

We therefore first extend the standard search model of the labour market to not only include active labour-market programmes but also to adequately take into account the differences between those job-seekers who have participated (or are about to) in a policy measure and those who have not. As becomes clear from the theoretical model, it is

by no means obvious what the outcome on overall labour-market performance is when the number of programme participants is changed. Thus, we test our theoretical model empirically using the very rich administrative data of the Federal Employment Agency (*Bundesagentur für Arbeit*) described in Section 4.2. We present the results in Section 4.3 before deriving conclusions in Section 5.

2 Theoretical Model

2.1 Matching Technology

The standard matching function describes the relationship between the number of new "matches" M between individuals searching for a job and firms in a given time period as a function of the number of job-seekers S and vacancies V (see Pissarides, 2000):

$$M = m(S, V) \tag{1}$$

This function can easily be augmented as in e.g Lehmann (1995) or Puhani (1999) to include participants of different labour-market instruments:

$$M = m\left(Us(1 + \sum_{z=1}^{Z} \varepsilon_z P_z), V\right) \tag{2}$$

where U are the number of unemployed, ε_z is the effect of programme z and P_z are the number of participants in programme z where it is also assumed that the unemployed and the programme participants have different search intensities s. Equation (2) also forms the basis for the estimations in Hujer and Zeiss (2003). However, although the matching function is explicitly augmented to take the different search intensities of the two types of job-seekers into account, neither the implications of this for the (theoretical) general equilibrium are analysed, nor are the different degrees of search explicitly included in their regression analysis. Further, equation (2) implies that both unemployed and programme participants must coexist for a match to take place. We seek to overcome both these shortcomings in our paper.

As microeconometric evaluation studies have unanimously shown, (see e.g. Kluve 2006) there is a pronounced "lock-in-effect" whereby programme participants' search intensity decreases greatly (relative to that of the unemployed) during programme participation as they have much less time to actively look for a job. However, this may change towards the end of the programme and shortly after completion of the programme at which time they should be more successful than "similar" non-programme participants in finding a job –

at least if the programme is "successful". For these reasons, we augment the standard matching function and define it as:[2]

$$M = m(U + sP, V_u + V_p), \qquad P = \sum_{z=1}^{Z} P_z \tag{3}$$

with V_u and V_p as the vacancies posted for the unemployed and programme participants respectively. $s < 1$ is the search intensity of programme participants, i.e. the search intensity of the unemployed is normalised to unity. On the one hand, if a programme participant becomes unemployed directly after programme completion, she presumably has at least the same amount of time and effort which she can devote to looking for a job as an unemployed individual who has not completed such a measure. On the other hand, she obviously differs from an unemployed individual who has not participated in a programme due to the training she has received. Therefore, we interpret the search intensity s as an average search intensity which is valid for the time span from when an individual knows that she will participate ("Ashenfelter's dip" – Ashenfelter 1978) until "shortly" after programme completion.[3] For the same reasons, in the following, the group of programme participants is comprised of current participants and those that were participants until recently.

Although the unemployed have a higher search intensity, it will be assumed that they also have a lower on-the-job productivity and, as they are presumably less flexible in a job, a higher probability of losing their job. Therefore, firms must decide whether to open up a vacancy V_u for the currently unemployed, (and not about to enter an ALMP) or for those who are either currently in a programme or have just completed a programme V_p.[4] Hence, there are actually three types of job-seekers: Those which are not about to or have not recently completed a programme (U). Those which are unemployed but are about to start a policy measure (P) and those which are unemployed but have recently completed a programme. We will label the latter as Q. In the regression analysis in Section 4.3 we will differentiate between these three groups. Here, in order to keep the model tractable, we will only differentiate between U – with a higher search intensity but lower productivity – and P who have a lower average search intensity but are more productive and can be employed more flexibly within a firm in case the firm receives a negative shock.

The matching function (3) is strictly increasing in its arguments. Labour-market tightness is defined as $\theta = (v_u + v_p)/(u + sp)$, where variables in small letters are simply the stock

[2] In order to simplify the notation and where no information is lost, we suppress the time index t.

[3] For the empirical estimation, the length of this time period varies between the different labour- market policies.

[4] Obviously, firms will not write this in the job advertisement. However, it seems realistic to assume that firms will screen applications and only pick those that seem suitable for the job that they are offering.

variables relative to the size of the labour force L, e.g. $u = U/L$. The mass of job-seekers relative to the size of the labour force is the weighted sum of unemployed and programme participants, i.e. $u + sp$. The proportion of unemployed amongst this mass is denoted by $\phi = u/(u + sp)$ from which follows that the share of programme participants is given by $1 - \phi$. Given this and the above matching technology, firms will fill their vacancies with previously unemployed at the rate:

$$\frac{m\phi}{v_u + v_p} = m\left(\frac{1}{\theta}, 1\right) = \phi q(\theta) \tag{4}$$

and at the rate

$$\frac{m(1-\phi)}{v_u + v_p} = m\left(\frac{1}{\theta}, 1\right) = (1-\phi) q(\theta) \tag{5}$$

with people who are or were participating in a programme.

Denoting the share of vacancies for the unemployed by $\eta = v_u/(v_u + v_p)$ means that they find jobs at the rate:

$$\frac{m\eta}{u + sp} = \eta\theta q(\theta) \tag{6}$$

and similarly, the rate for the programme participants is:

$$\frac{m(1-\eta)}{u + sp} = (1-\eta)\theta q(\theta) \tag{7}$$

The properties of the matching function imply that the matching rate of workers (firms) is increasing (decreasing) in labour-market tightness θ and further that $\lim_{\theta\to 0} q(\theta) = \lim_{\theta\to\infty} \theta q(\theta) = \infty$ and $\lim_{\theta\to\infty} q(\theta) = \lim_{\theta\to 0} \theta q(\theta) = 0$.

2.2 Job Creation

Firms create new jobs as long as the expected returns are at least as high as the expected costs. It is assumed that output from a position that is occupied by a person coming directly out of unemployment is $y_u > 0$. When former programme participants are hired output is y_p with $y_p > y_u$. To fill a new position, firms must first post a vacancy and engage in (costly) search equal to $c > 0$ per unit time. From above, the rate at which jobs find new workers is given by $q(\theta)$ with each firm taking labour-market conditions, i.e. θ, as given.

Profit-maximisation requires that the profit from an additional vacancy is zero. If $V_k, k \in$

$\{p, u\}$ denotes the present-discounted value of the expected profit from a vacancy and J_k the same value from an occupied job, then the intertemporal optimisation solution for the vacancy-supply decisions is given by:

$$\rho V_u = -c + \phi q(\theta)(J_u - V_u) \tag{8}$$
$$\rho V_p = -c + (1-\phi) q(\theta)(J_p - V_p) \tag{9}$$

with ρ as the interest rate. As can be seen, this equation implies that the capital cost (l.h.s.) is equal to the expected return (r.h.s). Since in equilibrium all profit opportunities are exploited, the value of a vacancy must be zero, which implies:

$$J_u = \frac{c}{\phi q(\theta)} \tag{10}$$
$$J_p = \frac{c}{(1-\phi) q(\theta)} \tag{11}$$

i.e. that the expected profit from a new job equals the expected costs of hiring a new worker.

It is assumed that per unit time there is a constant probability that a job needs to be terminated due to negative idiosyncratic shocks. However, it is further assumed that people who were in a training programme are more skilled and therefore also more flexible as to which tasks they can perform within a firm. Therefore, if a job needs to be terminated, it is easier to transfer these people within the company than it is for those who were never in such a programme. Therefore, $\lambda_u > \lambda_p$ with $\lambda_k, k \in \{p, u\}$ as the respective job-destruction rate. Using this, the optimal asset value of an occupied job (again under the condition that the value of a vacancy is zero in equilibrium) is

$$\rho J_u = y_u - w_u - \lambda_u J_u \tag{12}$$
$$\rho J_p = y_p - w_p - \lambda_p J_p \tag{13}$$

where $w_k, k \in \{p, u\}$ is the wage paid to a worker of type k. Equations (12) and (13) imply that the capital costs of maintaining the job (l.h.s) are equal to the returns which is the difference between the output the worker produces, his or her wage $w_k, k \in \{p, u\}$ and the probability that the job needs to be terminated.

From (10), (11), (12) and (13) it follows

$$y_u - w_u - \frac{(\rho + \lambda_u)c}{\phi q(\theta)} = 0 \tag{14}$$
$$y_p - w_p - \frac{(\rho + \lambda_p)c}{(1-\phi) q(\theta)} = 0 \tag{15}$$

2.3 Workers

Workers bargain with the firms they meet up with over the wage level. The wage level they are willing to accept will depend on the income they receive during search and the expected income at other firms. It is assumed that a worker earns a fixed amount of (unemployment) benefits b whilst unemployed or in a programme. U_u and U_p denote the respective present-discounted value of being unemployed or being in a programme. $W_k, k \in \{p, u\}$ is the value of being employed. From this, an equilibrium is characterised by

$$\rho U_u = b + \eta\theta q(\theta)(W_u - U_u) \tag{16}$$

and similarly for programme participants

$$\rho U_p = b + (1-\eta)\theta q(\theta)(W_p - U_p) \tag{17}$$

Employed workers earn a wage $w_k, k \in \{p, u\}$ but at each moment in time face the probability $\lambda_k, k \in \{p, u\}$ of losing their job. Of those laid off, a proportion ψ join the pool of unemployed and $(1-\psi)$ start an active labour market programme. However, the individual cannot influence this decision as the labour-market institution which finances the programme determines who becomes a participant and who does not. Hence, the equilibrium conditions are:

$$\rho W_u = w_u + \lambda_u[\psi(U_u - W_u) + (1-\psi)(U_p - W_p)] \tag{18}$$

and

$$\rho W_p = w_p + \lambda_p[\psi(U_u - W_u) + (1-\psi)(U_p - W_p)] \tag{19}$$

Equations (16) and (18) can be combined to yield

$$\rho U_u = \frac{b(\rho + \psi\lambda_u) + \eta\theta q(\theta)[w_u + \lambda_u(1-\psi)(U_p - W_p)]}{\rho + \psi\lambda_u + \eta\theta q(\theta)} \tag{20}$$

By analogy, the net difference in being employed as a former programme participant is

$$\rho U_p = \frac{b(\rho + (1-\psi)\lambda_p) + (1-\eta)\theta q(\theta)[w_p + \lambda_p\psi(U_u - W_u)]}{\rho + (1-\psi)\lambda_p + (1-\eta)\theta q(\theta)} \tag{21}$$

2.4 Wage Determination

Once a firm and suitable worker meet, they must agree on a wage. Each job-match yields an economic rent equal to the sum of the expected search costs of the firm and worker, respectively. This rent is shared according to the NASH-bargaining solution.

The wage rate will differ depending on the previous status of the worker as the time it takes to search for a new worker, the productivity of the worker and the expected job-termination date all depend on whether the worker was previously unemployed or in a programme.

The wage given by the NASH-bargaining solution maximises the weighted product of the firms's and worker's net return from the match where the weights are determined by the respective bargaining power of the negotiating parties, i.e.

$$w_k = \arg\max_{w_k} (W_k - U_k)^{\beta} (J_k - V_k)^{1-\beta}, \qquad k \in \{p, u\}$$

with β as the workers bargaining power. From this it follows that

$$W_k - U_k = \beta(J_k - V_k + W_k - U_k), \qquad k \in \{p, u\} \tag{22}$$

Inserting equations (12), (13) as well as (18) and (19) into the above equation yields:

$$w_u = \beta y_u + (1-\beta)\rho U_u + \frac{(1-\psi)\lambda_u[(1-\beta)\rho U_p + \beta y_p - w_p]}{\psi \lambda_p} \tag{23}$$

for the unemployed and

$$w_p = \beta y_p + (1-\beta)\rho U_p + \frac{\psi\lambda_p[(1-\beta)\rho U_u + \beta y_u - w_u]}{(1-\psi)\lambda_u} \tag{24}$$

for programme participants.

Inserting equations (10) and (16) into equation (22) and noting that $V_k = 0$ in equilibrium yields

$$\rho U_u = b + \frac{\beta c \eta \theta}{\phi(1-\beta)} \tag{25}$$

Similarly, from (11), (17) and (22) it follows that

$$\rho U_p = b + \frac{\beta c (1-\eta)\theta}{(1-\phi)(1-\beta)} \tag{26}$$

Combining (23) with (25) and (26) means that the wage for the previously unemployed can be rewritten as:

$$w_u = \frac{1}{(1-\phi)\phi(\lambda_p(\beta\rho\psi-(1-\beta)\lambda_u-\rho)-\rho(\rho+\lambda_u(1-\beta(1-\psi))))}\times$$
$$\Big\{\big(\rho+\lambda_u)(\beta\phi\lambda_u(1-\psi)(c\beta\theta(1-\eta)-(y_p-b)(1-\phi)(1-\beta))-$$
$$(1-\phi)(c\beta\eta\theta+b\phi(1-\beta))((1-\beta\psi)\lambda_p+\rho)\big)-$$
$$\beta(1-\phi)\phi y_u(\rho(\rho+\psi\lambda_u)+\lambda_p(\rho(1-\beta\psi)+(1-\beta)\psi\lambda_u))\Big\} \quad (27)$$

Similarly, the wage of former programme participants is

$$w_p = \frac{1}{\lambda_p(\rho+\lambda_u(1-\beta)-\beta\rho\psi)+\rho(\rho+\lambda_u(1-\beta(1-\psi)))}\times$$
$$\Big\{\beta y_p\big((1-\psi)\lambda_p(\rho+\lambda_u-\beta\lambda_u)+\rho(\rho+\lambda_u(1-\beta(1-\psi)))\big)+$$
$$\frac{(\rho+\lambda_p)\big(c\beta\theta(1-\eta)+b(1-\beta)(1-\phi)\big)(\rho+\lambda_u(1-\beta(1-\psi)))}{1-\phi}-$$
$$\frac{(\rho+\lambda_p)\beta\psi\lambda_p\big(c\beta\eta\theta-\phi(1-\beta)(y_u-b)\big)}{\phi}\Big\} \quad (28)$$

2.5 Labour-Market Equilibrium

The number of unemployed who find jobs in any arbitrary small time interval δt is $\eta\theta q(\theta)uL\delta t$. Due to adverse shocks, during the same time interval, a worker faces the exogenous probability of $\lambda_k\delta t, k \in \{p,u\}$ of losing his or her job. Therefore, per unit time the average number of workers who found a job directly out of unemployment but are now dismissed is

$$\phi(1-u-p)\lambda_u L\delta t \quad (29)$$

In a steady-state equilibrium, these two flows must be equal, hence

$$\eta\theta q(\theta)uL = \phi(1-u-p)\lambda_u L$$

from which follows

$$u = \frac{\phi(1-p)\lambda_u}{\phi\lambda_u+\eta\theta q(\theta)} \quad (30)$$

The analogous steady-state condition for programme participants is

$$p = \frac{(1-\phi)(1-u)\lambda_p}{(1-\phi)\lambda_p + (1-\eta)\theta q(\theta)} \tag{31}$$

2.6 Steady-State Equilibrium

The general equilibrium must simultaneously satisfy the job-creation conditions (14) and (15), the wage equations (27) and (28) and the labour-market equilibrium conditions (30) and (31).

Of central interest here is what happens to the equilibrium unemployment rate if the (relative) number of programme participants is increased, i.e. ϕ decreases. This rate can be derived by first inserting (31) into (30) and solving for u which yields:

$$u = \frac{(1-\eta)\phi\lambda_u}{\phi\lambda_u + \eta\lambda_p - \phi\eta(\lambda_p + \lambda_u) + (1-\eta)\eta\theta q(\theta)} \tag{32}$$

from which the aggregate unemployment rate $\tilde{u} = \phi u + (1-\phi)p$ is determined as:

$$\tilde{u} = \frac{\eta\lambda_p(1-2\phi) + \phi^2(\eta(\lambda_p - \lambda_u) + \lambda_u)}{\phi\lambda_u + \eta\lambda_p - \phi\eta(\lambda_p + \lambda_u) + (1-\eta)\eta\theta q[\theta]} \tag{33}$$

This equation symbolises the Beveridge curve.

In the equilibrium, the share of unemployed amongst all job-seekers must be equal to the share of workers who are dismissed and subsequently do not participate in a programme, i.e. $\phi = \psi$. Noting this, the job-creation curve is derived by eliminating w_u and w_p from equations (14), (15), (27) and (28) which results in:

$$\begin{aligned}
&\frac{1}{q[\theta]\big(\lambda_p(\rho + (1-\beta)\lambda_u - \beta\rho\phi) + \rho(\rho + (1-\beta(1-\phi))\lambda_u)\big)} \times \\
&\Bigg\{\Big(\rho + \lambda_u\Big)\Bigg((c\rho + q[\theta](c\beta\eta\theta - \phi(1-\beta)(y_u - b)))(\rho + (1-\beta\phi)\lambda_p) + \\
&(c\rho(1-\beta(1-\phi)) + \beta\phi q[\theta]((1-\phi)(1-\beta)(y_p - b) - c\beta\theta(1-\eta)) + c(1-\beta)\lambda_p)\lambda_u\Bigg) - \\
&\Big(\rho + \lambda_p\Big)\Bigg(c\big(\lambda_p(\rho - \beta\rho\phi + (1-\beta)\lambda_u) + \rho(\rho + (1-\beta(1-\phi))\lambda_u)\big) + \\
&q[\theta]\big(\beta(1-\phi)(\phi(1-\beta)(y_u - b) - c\beta\eta\theta)\lambda_p + \\
&(c\beta\theta(1-\eta) + (1-\beta)(1-\phi)b)(\rho + (1-\beta(1-\phi))\lambda_u) - \\
&\qquad (1-\beta)(1-\phi)y_p(\rho + (1-\beta(1-\phi))\lambda_u)\big)\Bigg)\Bigg\} = 0
\end{aligned} \tag{34}$$

The general equilibrium is found in the intersection of the Beveridge curve (33) and the steady-state job-creation condition (34). Unfortunately, there is no unique solution for labour-market tightness θ. Hence, in at least theoretically it is not possible to say whether putting more (unemployed) people into active labour-market programmes will actually reduce the (local) unemployment rate or not. For this reason, we will attempt to empirically estimate our theoretical model as described in Section 4 in more detail. First, however, we will describe the active labour market policies which we include in the empirical analysis.

3 Active Labour Market Programmes in our Analysis

3.1 Institutional Setup

Active labour market policy has a long tradition in Germany. The starting point was the Employment Promotion Act (*Arbeitsförderungsgesetz*) in 1969. Responsible for the implementation of labour-market programmes in Germany is the Federal Employment Agency and its 178 local branches at the regional level. Given the favorable economic situation at the end of the 1960s, the aim of Employment Promotion Act was full employment and to balance labour demand and supply. As a consequence of German reunification in 1990 and a further subsequent sharp rise in unemployment – most notably in the eastern part – there was the need for a completely new legal basis for ALMP. Thus, in 1998, the Employment Promotion Act was replaced by the Social Security Code III (*Sozialgesetzbuch III*). The main aim of this Act is a sustainable re-integration of unemployed individuals into regular employment. A particular focus is the integration of people with severe labour-market problems such as the elderly or long-term unemployed. In addition, for the first time in Germany as part of the *Hartz*-reforms, the Social Security Code III now entails a legal obligation that ALMP measures have to be evaluated. Finally and most important for the present analysis, there was a shift of responsibility from the head office to the local employment offices, i.e. a decentralisation of ALMP took place. The Federal Employment Agency allocates funds for ALMP to every local employment agency in a pooled form. The allocation of the overall budget from the federal to the regional level is part of the negotiations between the federal and local offices and is based on a whole series of local labour-market indicators (see Blien 2002). The local employment offices then have a large degree of freedom as to how they split the budget between different measures. This procedure is flexible enough to take local characteristics into account and to weight the measures differently according to local requirements.

3.2 Active Labour Market Programmes

Labour-market measures may be divided into two groups: passive and active measures. In 2004 the expenditures for passive measures were 49 billion euros – by far the largest part was spent on unemployment-benefit payments. The expenditures for measures of active labour-market policy add up to 19 billion euros. A large number of measures of employment promotion exist in Germany. If there are any significant effects of any measure on a macroeconomic level, then they are most likely to occur for programmes which have a "large" number of participants relative to the size of the labour market. For this reason, we concentrate our analysis on the five biggest programmes: short-term vocational training, long-term vocational training, training measures, employment subsidies and job-creation schemes. These are briefly described in the following.

3.2.1 Vocational Training and Training Measures

The vocational-training measures (*Förderung der beruflichen Weiterbildung*) are designed to improve and/or adjust the qualifications of the unemployed to better fit labour demand. The measures differ considerably and can be broadly characterised as those lasting less than six months – which we call short-term vocational training – and long-term vocational training lasting up to three years. The latter retrain unemployed into new professions.

Closely related to the short-term vocational training are the training measures (*Trainingsmaßnahmen*). These can last up to eight weeks but are often much shorter. Here, individuals are coached how to write job applications or receive short language or computer courses. Training measures can be further divided into classroom training measures and training measures which take place in a firm. Sometimes, different training measures are combined or are followed by vocational training. With the introduction of the recent labour-market reforms and as a part of the first microeconomic evaluation results, short-term vocational training and training measures have gained in importance while spending on long-term vocational training was reduced considerably.

3.2.2 Employer Subsidies

There are several different employment subsidies which we consider here. From a quantitative point of view, the setting-in allowance (*Eingliederungszuschuss, EGZ*) is the most important. This is payed to employers who hire formerly unemployed elderly (over 50), handicapped people or people with special placement difficulties (e.g. due to drug addiction). Apart from hiring elderly, employers making use of this benefit are compelled to keep the worker for the same amount of time as they received the subsidy once it

has run out. The subsidy is normally paid a maximum of twelve months but can in extreme cases (e.g. for highly disabled people) be granted for up to eight years. The other subsidies we consider are the *Eingliederungsvertrag, EV* which is a contract between the unemployed person and his or placement officer; the recruitment subsidy for start-ups (*Eingstellungszuschuss für Neugründungen, EZN*) a subsidy paid to employers who have been self-employed for less than two years create a new position for which a formerly unemployed individual is hired; the *Beschäftigungshilfen für Langzeitarbeitslose, BHI* – a special programme for the long-term unemployed; the *Einstellungszuschauss bei Vertretung, EZV* a subsidy the employer received if he hires an unemployed for the time a regular employee is being trained.

3.2.3 Job-Creation Schemes

There are two main job-creation schemes: The *Arbeitsbeschaffungsmaßnamen, ABM* and the *Strukturanpassungsmaßnahmen, SAM*. These programmes, which are usually realised in the public and non-profit sectors, aim at maintaining the employability of the participants. Moreover, in regions with high unemployment rates (i.e. especially in eastern Germany), they have an additional socio-political component in trying to bring the unemployed back into contact with work.

4 Econometric Analysis

4.1 Econometric Specification of the Matching Function

As shown in Section 2.6, from the theoretical model on a macroeconomic level it is by no means clear whether an increase in the number of programme participants leads to a lower unemployment rate or not. Hence, in the following, we empirically test the above model. The model highlighted the importance of both the different search intensities and productivities of programme participants relative to the unemployed. In order to capture these effects, we adopt a three step approach.

Initially we test the "classic" matching function with only the job-seekers S and vacancies V as arguments. The results from this empirical specification will provide the benchmark for the other empirical estimates. Assuming a Cobb-Douglas matching function and taking logarithms of equation (1) leads to the following matching function which serves as starting point for our empirical analysis:

$$\ln M_{rt} = k + \alpha \ln S_{rt-1} + \beta \ln V_{rt-1} + d_t + d_r + \epsilon_{rt} \tag{35}$$

As we have panel data, the empirical specification also includes time (d_t) and regional (d_r) fixed effects.

Then we augment the matching function by differentiating the job-seekers between current programme participants P, former programme participants Q and the remaining registered unemployed U (see Section 4.2 for more detail). In order to do this, we must first transform our theoretical model into a empirically testable equation. Similar to Hynninen and Lahtonen (2007); Ibourk et al. (2004), we first define the number of "effective" job-seekers as $X = U + sP + hQ$ where s and h is the search effectiveness of the current and former programme participants, respectively. Hence, our matching function (35) now becomes:

$$\ln M_{rt} = k + \alpha \ln X_{rt-1} + \beta \ln V_{rt-1} + d_t + d_r + \epsilon_{rt}$$

To be able to estimate s and h we expand X as follows:

$$\begin{aligned} X &= U + P + Q + sP + hQ - P - Q \\ &= S + (s-1)P + (h-1)Q, \qquad S = U + P + Q \end{aligned}$$

Again assuming a Cobb-Douglas specification and the matching technology A results in:

$$\begin{aligned} M_{rt} &= A X_{r,t-1}^{\alpha} V_{r,t-1}^{\beta} \\ &= A \left(S + (s-1)P + (h-1)Q\right)_{r,t-1}^{\alpha} V_{r,t-1}^{\beta} \\ &= A S_{r,t-1}^{\alpha} \left(\frac{S}{S} + (s-1)\frac{P}{S} + (h-1)\frac{Q}{S}\right)_{r,t-1}^{\alpha} V_{r,t-1}^{\beta} \end{aligned}$$

From this, the empirical model becomes:

$$\begin{aligned} \ln M_{rt} = k + \alpha \ln S_{r,t-1} + \alpha \underbrace{\ln \left(1 + (s-1)\frac{P}{S} + (h-1)\frac{Q}{S}\right)_{r,t-1}}_{\approx (s-1)\frac{P}{S} + (h-1)\frac{Q}{S}} \\ + \beta \ln V_{r,t-1} + d_r + d_t + \epsilon_{rt} \end{aligned}$$

$$= k + \alpha \ln S_{r,t-1} + \alpha_p \tilde{P}_{r,t-1} + \alpha_q \tilde{Q}_{r,t-1} + \beta \ln V_{r,t-1} + d_r + d_t + \epsilon_{rt} \tag{36}$$

where $\alpha_p = \alpha(s-1), \alpha_q = \alpha(h-1), \tilde{P} = P/S$ and $\tilde{Q} = Q/S$. The coefficients we obtain for α_p and α_Q will enable us to test our hypothesis that the search effectiveness significantly differs for the two groups of programme participants relative to that of the

registered unemployed. Hence, $\alpha_p < 0$ and $\alpha > 0$ implies $s < 1$ and therefore a negative effect of current programme participation on outflows from unemployment. A similar argumentation holds for α_q.

To keep the theoretical model tractable, we did not differentiate between P and Q. Hence, we were not able to unambiguously determine the labour-market effects of increasing the number of programme participants as there were two opposing effects: On the one hand, a higher number of Ps reduces the search effectiveness leading to lower outflows. On the other hand, the productivity of the participants increases leading to higher outflows. In the empirical estimation, we expect the negative effect due to lower search effectiveness to be concentrated on the Ps, whilst for the Qs the higher productivity should dominate. Thus, we expect α_p to be negative and α_q to be positive.

We are not only interested in the aggregate effect of programme participation. ALMP are heterogeneous and hence their influence on the matching process differs. Therefore, we finally differentiate between the programmes i with $i = 1 \dots I$ described in Section 3.2 and obtain the following matching function which we want to estimate in the last step:

$$\ln M_{rt} = k + \alpha \ln S_{r,t-1} + \sum_{i=1}^{I} \alpha_{pi} \tilde{P}_{ir,t-1} + \sum_{i=1}^{I} \alpha_{qi} \tilde{Q}_{ir,t-1} + \beta \ln V_{r,t-1} + d_r + d_t + \epsilon_{rt} \tag{37}$$

4.2 Data

We use the rich administrative data set from the Federal Employment Agency (FEA) for our analysis. This data is converted to the so-called "Integrated Employment Biographies" (*Integrierte Erwerbsbiografie* – IEB) by the Institute for Employment Research, Germany. With this data it is possible to observe all unemployment, programme or employment spells (the latter as long as the employment is either liable to social security contributions or is a "Mini-Job" in which the individual earns a maximum of 400 € per month) on a daily basis. Here, the data starts in January 2002 and ends in December 2004. Using this data, we aggregate the individual daily data to quarterly data by local employment offices (*Arbeitsagenturbezirke*).[5]

As a successful match in a certain quarter we consider inflow in unsubsidised employment of people who were registered as unemployed or participated in a programme at the end of the previous quarter. Employers who hire employees and receive a setting-in allowance (*Eingliederungszuschuss*) have to employee these workers for the same amount of time that they received the subsidy once the subsidy runs out. Hence, we include this mandatory

[5] We sincerely thank Steffen Kaimer and Cerstin Erler for performing these aggregations for us.

employment spell to the programme length and a "true" match in our sense of the meaning only takes place if the employment relationship continues after this mandatory period. However, if a worker whose employer formerly received such a subsidy switches jobs, then this is immediately counted as a match.

The vacancies V are the stock of vacancies registered at the FEA for unsubsidised jobs (which are subject to social insurance contributions) at the end of the previous quarter. The job-seekers S are comprised of programme participants P, former programme participants Q and the remaining registered unemployed U.

As we are interested in the effect that different search intensities have on the matches, we want to group our job-seekers accordingly. Hence, we count both current and future programme participants in our Ps. Current programme participants as they have a lower search intensity due to the lock-in-effect. Future programme participants may also reduce their search intensity once they are informed that they will participate in a measure (Ashenfelter's dip). To identify current programme participants is unproblematic. Unfortunately, we have no information in our data about the date future programme participants are informed about the begin of their programme. How early they receive this notification in turn depends on the programme they will attend. Generally speaking, the longer a programme lasts the less often it starts per year and hence the longer is the average waiting time between notification and actual start. Therefore, for each quarter, a programme participant P is defined as a person who is either participating in a programme on the last day of the previous quarter or who is unemployed on the last day of the previous quarter and will start a programme in the next x_P weeks in the current quarter where x_P depends on the programme.

We have a similar problem distinguishing between former programme participants Q who are currently unemployed and the remaining registered unemployed. We assume that these two groups only differ in their productivity and not in their search intensity because the lock-in-effect should disappear once the measures end. The expected higher productivity of former participants is for example a higher level of human capital due to the measure. However, human capital depreciates over time. Hence, the difference in productivity between former programme participants and other unemployed only lasts for a certain time. We assume that how long a higher productivity persists again differs between the programmes. Therefore, our Qs are defined as individuals who are unemployed at the end of the previous quarter and participated in a programme which ended within the last x_Q weeks prior to the end of that quarter. Finally, if an individual completes a programme within the first half of a quarter, we also count the person as a former programme participant.[6]

[6] Appendix A.1 lists how long the time spans are for each programmes that we analyse.

4.3 Empirical Results

As is well known, the labour-market performance varies greatly between the western and eastern part of Germany, for example, the average unemployment rate in 2004 was 9.4 percent in western and 20.1 percent in eastern Germany. This means that the extent of programme participation, the composition of the programme participants and also potentially the effects of the individual programmes might be different. Therefore, we analyse western an eastern Germany separately.

For each part of Germany we estimate three different specifications, which are explained in Section 4.1. To take into account the panel structure of our dataset, these specifications include time and regional fixed effects. To get robust standard errors for our least squares dummy variable estimator, we use Arellano (1987) robust standard errors.

Table 1 shows the coefficients and significance levels of our estimation results.[7] As can be seen from the first empirical specification (Model 1), the matching function exhibits large returns to scale in western Germany as well as in eastern Germany. The second specification differentiates the job-seekers into current (P) and former (Q) programme participants. Here, we also include further exogenous variables such as the share of highly qualified, over 50 year old and migrants. Again, we find similar results for both western and eastern Germany. Concerning the current programme participants, there does not seem to be evidence of a macroeconomic lock-in-effect, i.e. the number of matches in a region does not significantly change if there are relatively more programme participants in the district of a local employment office. However, the number of matches does significantly increase the higher the share of former programme participants Q amongst the job-seekers in a region is. This last finding is exactly what we would expect from the theoretical model.

In Model 3 we differentiate between six types of active labour-market programmes. The results show that the influence on the matching process differs between them. Also, for some programmes the effects vary between eastern and western Germany. In eastern Germany there is no significant effect of any programme participation beside long-term vocational training. Here, we do find a negative coefficient, i.e. a higher share of these programme participants reduces the number of matches. This result has also been found on a micro-level by, for example, Lechner and Wunsch (2007); Hujer et al. (2006). This negative effect appears also in western Germany. Looking at participants of training measures, we find a positive effect of their share on the number of matches only in western Germany. This result is irrespective of whether the training measures are in a firm or not. The effect is probably due to the fact that these measures are only of a short duration and

[7] See Table A.2 for a description of the meanings of the abbreviations used in Table 1.

Table 1: Estimation Results

Dep. Variable: $\ln M_{r,t}$						
	Western Germany			Eastern Germany		
Variable	Model 1	Model 2[a)]	Model 3[a)]	Model 1	Model 2[a)]	Model 3[a)]
$\ln S_{r,t-1}$	1.653***	1.553***	1.472***	1.881***	1.832***	1.687***
$\ln V_{r,t-1}$	0.054***	0.059***	0.055***	0.067***	0.037*	0.016
$p_{r,t-1}$		-0.163			-0.074	
$q_{r,t-1}$		2.007***			2.424***	
$jcs\_p_{r,t-1}$			-1.272			0.136
$short\_trm\_vt\_p_{r,t-1}$			-0.007			-0.236
$long\_trm\_vt\_p_{r,t-1}$			-2.615***			-2.644***
$tm\_in\_firm\_p_{r,t-1}$			8.488*			17.781
$tm\_out\_firm\_p_{r,t-1}$			2.060**			1.104
$es\_p_{r,t-1}$			1.039			0.636
$jcs\_q_{r,t-1}$			-2.895			7.414***
$short\_trm\_vt\_q_{r,t-1}$			1.858*			8.882***
$long\_trm\_vt\_q_{r,t-1}$			0.516			5.932*
$tm\_in\_firm\_q_{r,t-1}$			5.879**			11.475**
$tm\_out\_firm\_q_{r,t-1}$			1.476***			1.625*
$es\_q_{r,t-1}$			2.019			-7.531
N	1692	1692	1692	420	420	420

*** Significant at the 1%-level; ** Significant at the 5%-level; * Significant at the 10%-level
[a)] With further exogenous variables, see Table A.3

hence we are probably counting many of these people as participants even if they have already completed the measure (as is the case if they finish their measure in the second half of a quarter).

Looking at the effects of former programme participants, we find that in both parts of Germany there is a positive effect for short programmes, i.e. short-term vocational training and training measures. If the fraction of people who have completed such a measure within the last three months increases, the subsequent number of matches in that region also increases. To our own surprise, we find positive significant effects for job-creation schemes and long-term vocational training measures in eastern Germany. This result is in contrast to the findings of nearly all other macroeconomic studies.

5 Conclusion

The main goal of our analysis is to analyse the effects of active labour-market policy on the matching process between unemployed and vacancies in small labour-market regions. To this end, we first extend the standard matching model to be able to explicitly differentiate between programme participants and unemployed. From this model it is by no means clear whether increasing the number of people in ALMP reduces the local unemployment

rate or not. On the one hand, former programme participants have higher productivities which reduces unemployment and on the other hand they have lower search intensities during a measure which increases unemployment. Therefore, in a second step, we test the theoretical model. We draw on quarterly data for the time span 2002 to 2004 using the "Integrated Employment Biographies" by the Institute for Employment Research, Germany, which is based on administrative data from the Federal Employment Agency and aggregated on the level of local employment offices. Here we are able to divide the job-seekers not only into programme participants and registered unemployed, but further into current programme participants, former programme participants and the remaining registered unemployed.

By examining the effects of ALMP separately for eastern and western Germany we find similar results for both parts. The share of current programme participants has no significant effect on the number of matches in a region, whereas the share of former programme participants is positively significant. This means that a higher regional intensity of active labour-market programmes seems to improve the matching efficiency in Germany. When differentiating between different types of measures, we find varying effects not only for different programmes but also for eastern and western Germany. Surprisingly we find positive significant effects of former programme participants for almost every considered measure in eastern Germany. In contrast to studies on the micro level, we even find positive effects for job-creation schemes. For western Germany we only find positive effects for measures with a short duration. Our results highlight the importance of taking different regional structures of the labour market in both parts of Germany into account.

Appendix

A.1 Time Spans of the Individual Programmes

The following table lists in the column for the programme participants P how long we assume the time span is between their notification that they will participate in an active policy measure and the actual start of the programme. In the column for the currently unemployed former programme participants – in our notation the Qs – we give the maximum time span between the end of a programme in the previous quarter and the end of that quarter.

Table A.1: Time Spans

Programme	**Time Span**	
	x_P	x_Q
Job-creation schemes	2 months	3 months
Short-term vocational training ($\leq$ 6 months)	1 month	3 months
Long-term vocational training ($>$ 6 months)	3 months	6 months
In-firm training measures	1 week	3 months
Out-of-firm training measures	1 week	3 months
Employment subsidies	1 month	6 months

A.2 Descriptive Statistics

Table A.2: List of Variables Used in the Regression Analysis

Abbreviation	**Description**
M_{rt}	Number of matches in region r at time t
$S_{r,t-1}$	Number of job-seekers in region r at the end of the previous quarter
$V_{r,t-1}$	Number of vacancies in region r at the end of the previous quarter
$p_{r,t-1}$	Share of participants in ALMP amongst total number of job-seekers in region r at the end of the previous quarter

Table A.2: (continued)

Abbreviation	**Description**
$q_{r,t-1}$	Share of former participants in ALMP amongst total number of job-seekers in region r at the end of the previous quarter
$jcs\_p_{r,t-1}$	Share of participants in job-creation schemes relative to total number of job-seekers in region r at the end of the previous quarter
$short\_trm\_vt\_p_{r,t-1}$	Share of participants in short-term vocational training measures relative to total number of job-seekers in region r at the end of the previous quarter
$long\_trm\_vt\_p_{r,t-1}$	Share of participants in long-term vocational training measures relative to total number of job-seekers in region r at the end of the previous quarter
$tm\_in\_firm\_p_{r,t-1}$	Share of participants in in-firm training measures relative to total number of job-seekers in region r at the end of the previous quarter
$tm\_out\_firm\_p_{r,t-1}$	Share of participants in out-of-firm training measures relative to total number of job-seekers in region r at the end of the previous quarter
$es\_p_{r,t-1}$	Share of participants in employer-subsidies relative to total number of job-seekers in region r at the end of the previous quarter
$jcs\_q_{r,t-1}$	Share of former participants in job-creation schemes relative to total number of job-seekers in region r at the end of the previous quarter
$short\_trm\_vt\_q_{r,t-1}$	Share of former participants in short-term vocational training measures relative to total number of job-seekers in region r at the end of the previous quarter
$long\_trm\_vt\_q_{r,t-1}$	Share of former participants in long-term vocational training measures relative to total number of job-seekers in region r at the end of the previous quarter
$tm\_in\_firm\_q_{r,t-1}$	Share of former participants in in-firm training measures relative to total number of job-seekers in region r at the end of the previous quarter
$tm\_out\_firm\_q_{r,t-1}$	Share of former participants in out-of-firm training measures relative to total number of job-seekers in region r at the end of the previous quarter

Table A.2: (continued)

Abbreviation	**Description**
$es\_q_{r,t-1}$	Share of former participants in employer-subsidies relative to total number of job-seekers in region r at the end of the previous quarter

Table A.3: List of Additional Control Variables Used in the Regression Analysis

Abbreviation	**Description**
$hq\_p_{r,t-1}$	Share of highly qualified (degree from a technical college or university) amongst participants in ALMP in region r at the end of the previous quarter
$hq\_q_{r,t-1}$	Share of highly qualified (degree from a technical college or university) amongst former participants in ALMP in region r at the end of the previous quarter
$hq\_u_{r,t-1}$	Share of highly qualified (degree from a technical college or university) amongst unemployed in region r at the end of the previous quarter
$mq\_p_{r,t-1}$	Share of qualified (professional degree) amongst participants in ALMP in region r at the end of the previous quarter
$mq\_q_{r,t-1}$	Share of qualified (professional degree) amongst former participants in ALMP in region r at the end of the previous quarter
$mq\_u_{r,t-1}$	Share of qualified (professional degree) amongst unemployed in region r at the end of the previous quarter
$for\_eg\_p_{r,t-1}$	Share of foreigners and Ethnic Germans amongst participants in ALMP in region r at the end of the previous quarter
$for\_eg\_q_{r,t-1}$	Share of foreigners and Ethnic Germans amongst former participants in ALMP in region r at the end of the previous quarter
$for\_eg\_u_{r,t-1}$	Share of foreigners and Ethnic Germans amongst unemployed in region r at the end of the previous quarter
$o50\_p_{r,t-1}$	Share of over 50 year olds amongst participants in ALMP in region r at the end of the previous quarter
$o50\_q_{r,t-1}$	Share of over 50 year olds amongst former participants in ALMP in region r at the end of the previous quarter

Table A.3: (continued)

Abbreviation	**Description**
$o50\_u_{r,t-1}$	Share of over 50 year olds amongst unemployed in region r at the end of the previous quarter

Table A.4: Average Number of Participants

Programme	**Western Germany**			**Eastern Germany**		
	2002	2003	2004	2002	2003	2004
Job-creation schemes[a]	42,485	30,017	23,035	158,661	114,399	93,382
Short-term vocational training	49,453	39,507	34,389	24,701	16,792	13,861
Long-term vocational training	165,058	137,734	96,093	124,260	85,272	51,212
Out-Of-Firm Training measures	3,550	6,288	7,014	2,387	3,412	3,410
In-Firm Training measures	15,783	19,596	21,627	9,268	9,831	10,537
Employment subsidies[b]	66,754	62,227	41,621	104,025	103,296	72,318

[a] ABM, SAM, BSI
[b] EGZ,EV, EZN, BHI, EZV

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