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Benchmarking Regions: Estimating the Counterfactual Distribution of Labor Market Outcomes

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Non-technical summary

Local labor markets show strong regional differences in labor outcomes and economic conditions. Regional differences affect the welfare of local populations as well as the effectiveness of local policy interventions. In regional context, when assessing the labor market outcomes and the effectiveness of policies, it is important to benchmark regional outcomes by the outcomes of comparable regions and by doing so to account for differences in labor market characteristics. Put differently, when looking at the outcome of one region it is necessary to know the expected outcome distribution for a region with the same labor market characteristics based on the outcomes of comparable regions.

This paper develops a new non-parametric approach to assess the local labor market performance and to benchmark labor market regions based on kernel matching. We suggest to estimate the conditional quantile position of a region as a relative performance measure based on the counterfactual conditional distribution of outcomes for a group of comparable regions. To evaluate the possible absolute scope for improvement and deterioration in the outcome variable, an absolute performance measure is estimated as the difference between the observed outcome in one region and a reference point - we take the median - from the counterfactual outcome distribution. We implement different similarity measures capturing the spatial heterogeneity in labor market characteristics and propose two different ways to model spatial proximity – geographical distance and relative commuting flows. Accounting for spillover effects from neighborhood is important since, in a regional context, the labor market situation in neighboring regions is likely to affect the performance of the analyzed employment office area.

The new benchmarking approach is applied to 176 labor market regions in Germany during the time period of 2006 to 2008. The outcome variable of interest is the rate of hirings into regular employment among the unemployed (integration rate). A two-dimensional leave-one-out cross-validation procedure regarding the prediction of the outcome variable is implemented in order to find an optimal weighting scheme between similarity in regional characteristics and spatial proximity. The results show that both observed labor market characteristics and spatial proximity are quite important to successfully match regions. Specifically, the modified Zhao (2004) distance measure and the geographic distance in logs work best in our applications. It turns out that the implied benchmark group of similar regions and the estimated relative and absolute performance remain quite stable over time. In addition, an examination of the matching quality shows only a negligible number of mismatch cases in some of the labor market characteristics considered.

Das Wichtigste in Kürze

Lokale Arbeitsmärkte weisen eine starke räumliche Heterogenität auf, die sich sowohl in der Arbeitsmarkperformance als auch in den wirtschaftlichen und strukturellen Rahmenbedingungen wiederspiegelt. Regionale Unterschiede beeinflussen sowohl den Wohlstand der lokalen Bevölkerung als auch die Effektivität von politischen Interventionen auf regionaler Ebene. Eine Performanceanalyse von lokalen Arbeitsmärkten erfordert deshalb den Ergebnisvergleich von Regionen mit ähnlichen Arbeitsmarktbedingungen und Charakteristika. Anders ausgedrückt, für die Leistungsmessung in einer Region ist die kontrafaktische Verteilung der Ergebnisvariablen von Regionen, die in ihren lokalen Gegebenheiten vergleichbar sind, von ausschlaggebender Bedeutung.

Dieses Papier entwickelt und implementiert einen neuen, nichtparametrischen Benchmarking Ansatz zur Performancemessung von Regionen unter Anwendung von kernbasierten Matchingverfahren. Die relative Performance einer Region wird anhand der bedingten Quantilsposition gemessen, welche sich als ein relatives Ausmaß der möglichen Leistungsverbesserung in der Gruppe von vergleichbaren Regionen interpretieren lässt. Weiterhin wird ein absoluter Perfromanceindikator als die Differenz zwischen der beobachteten Leistung in einer Region und einem Referenzwert aus der Verteilung der Ergebnisvariablen auf Basis aller anderen Regionen geschätzt. Wir wenden verschiedene Distanzmaße für die Vergleichbarkeit von Regionen in relevanten Arbeitsmarktcharakteristika an und schlagen zwei Alternativen zur Messung der räumlichen Nähe vor – geographische Distanz und relative Pendlerbewegungen. Räumliche Nähe ist im Rahmen eines Regionenmatching besonders wichtig, weil die Performance einer Region nicht nur von der lokalen Arbeitsmarktsituation der Region selbst, sondern auch von den Arbeitsmarktbedingungen benachbarter Regionen abhängt.

Das neue Benchmarkingkonzept wird für die 176 Arbeitsagenturbezirke in Deutschland für die Zeit von 2006 bis 2008 umgesetzt. Die abhängige Variable ist die Integrationsquote von Arbeitslosen. Um bei der Vergleichbarkeit von Regionen eine optimale Gewichtung zwischen Ähnlichkeit in Charaketristika und räumlicher Nähe herzustellen, wird eine zweidimensionale Kreuzvalidierungsprozedur bei der Vorhersage der Ergebnisvariablen eingesetzt. Unsere Analysen zeigen, dass für ein erfolgreiches Regionenmatching beide Dimensionen wichtig sind. Insbesondere die modifizierte Zhao (2004) Distanz und die logarithmierte geographische Distanz liefern die besten Ergebnisse. Es zeigt sich, dass die Benchmarkgruppen und die zwei geschätzten Performancemaße relativ stabil über die Zeit bleiben. Eine Überprüfung der Matchingqualität in den Charakteristika zeigt eine vernachlässigbar kleine Anzahl an Mismaches in einigen der betrachteten regionalen Variablen.

Benchmarking Regions: Estimating the Counterfactual Distribution of Labor Market Outcomes

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Abstract: This paper develops and implements a new benchmarking approach for labor market regions. Based on panel data for regions, we use nonparametric matching techniques to account for observed labor market characteristics and for spatial proximity. As the benchmark, we estimate the counterfactual distribution of labor market outcomes for a region based on outcomes of similar regions. This allows to measure both the rank (relative performance) and the absolute performance based on the actual outcome for a region. Our outcome variable of interest is the hiring rate among the unemployed. We implement different similarity measures to account for differences in labor market conditions and spatial proximity, and we choose the tuning parameters in our matching approach based on a cross-validation procedure. The results show that both observed labor market characteristics and spatial proximity are important features to successfully match regions. Specifically, the modified Zhao (2004) distance measure and geographic distance in logs work best in our applications. Our estimated performance measures remain quite stable over time.

Keywords: matching function, regional employment offices, performance measurement, nonparametric matching, conditional quantile positions

JEL-Classification: C14, J68, R50

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Contents

1 Introduction

The existence and persistence of regional labor market differences is widely acknowledged (OECD, 2000; Moretti, 2010). These differences affect the welfare of the local population and the effectiveness of local policy interventions. When assessing the labor market outcomes and the effectiveness of policies, it is important to benchmark regional outcomes by the outcomes of comparable regions. Thus, benchmarking has to account for differences in labor market characteristics. Put differently, when looking at the outcome of one region, it is useful to know the expected distribution of outcomes for a region with the same characteristics based on the outcomes of similar regions. This paper suggests to use nonparametric matching techniques to estimate the counterfactual distribution of labor market outcomes for a region. We account for both observed labor market characteristics and for spatial proximity, and we assess the labor market outcome for a region relative to the estimated counterfactual.

There already exists a large literature on frontier efficiency measurement (Battese and Coelli, 1995; Gong and Sickles, 1992; Worthington, 2001). The main idea of these techniques is to estimate the best possible outcome on some production frontier while accounting for differences in characteristics and decisions (henceforth, we refer both the characteristics and the decisions considered as covariates) which presumably affect the outcome. The problem is cast into a production process and technical efficiency of a unit of interest is measured relative to the 'best practice' on the production frontier, which is based on units that are sufficiently similar in the covariates considered. Important techniques applied in the literature are Data-Envelopment-Analysis (DEA) and Stochastic Frontier Analysis (SFA). DEA is a nonparametric deterministic approach relying on linear programming techniques (Gong and Sickles, 1992). SFA specifies a regression–type relationship which allows for frontier measurement in a stochastic setting by introducing a non-positive error term; the latter reflects the inefficiency relative to the expected efficient frontier (Battese and Coelli, 1995).

Both DEA and SFA have a number of disadvantages, that our suggested benchmarking method is able to address in a novel way. First, DEA and SFA have to specify some kind of production process by which efficiency is measured with regard to the specified production process and the set of covariates accounted for. For benchmarking, it may be desirable to exclude the decision variables of the unit of interest in order to assess its position just based on given characteristics. It does not have to be the case that the same functional form assumptions apply for DEA or SFA when a restricted set of covariates is used (Worthington, 2001). Second, DEA and SFA are sensitive to outliers, possibly caused by measurement error. It is therefore difficult to estimate the frontier which reflects the maximum (DEA) or the upper tail (SFA) of the empirical distribution of outcomes conditional on the covariates considered. Third, DEA is a flexible but purely deterministic method. SFA allows for random variation in outcomes but it is typically implemented in a way that assumes a constant parametric distribution of inefficiency in absolute terms relative to the frontier. Such a parametric model may not be flexible enough to account for the variation in outcomes and inefficiencies across units. Fourth, correspondingly, frontier efficiency measurement typically does not provide a benchmark for the dispersion of outcomes which varies with the covariates. Fifth, applications of DEA and SFA to our knowledge rarely account for spillover effects across units in a close geographic neighborhood. Using SFA this could be done by applying techniques from spatial econometrics. DEA could possibly use covariates from adjacent regions as additional inputs. Sixth, DEA and SFA only provide little guidance as to how to find the most comparable benchmark for a unit of interest. This is a challenging issue in small data sets when a large number of covariates has to be considered, these covariates vary strongly across units, and spatial spillover effects have to be accounted for.

While frontier efficiency measurement techniques attempt to estimate the efficiency relative to a fully specified production process, a benchmarking method may simply require a comparison level based on similar regions. Such an approach requires to identify similar regions based on exogenous labor market characteristics, i.e. the benchmarking method should provide some counterfactual estimate for the level of the outcome variable based on these similar regions. When decision variables are not used to define similarity of regions, the benchmarking method allows to investigate whether differences in decision variables account for the difference between the actual outcome and the estimated counterfactual outcome. In an influential study for the benchmarking practice for labor market regions in Germany, Blien et al. (2010) use a cluster analysis to identify clusters of similar labor market regions in Germany based on exogenous labor market characteristics. The study uses a matching function framework to identify the key labor market characteristics and estimate the clusters solely based on these observed characteristics of regions. The outcomes within a cluster provide a benchmark. Because of the similarity of observed characteristics the estimated clusters often involve various regions which are not too far apart. The clusters do not allow for heterogeneity in the region specific (local) definition of a suitable comparison group of regions.

This paper develops a new non-parametric approach to benchmark labor market regions based on kernel matching, accounting both for observed labor market characteristics and geographic distance.[1] We implement different similarity measures capturing the heterogeneity in local labor market conditions and propose two different ways to model spatial proximity – geographical distance and relative commuting flows. Accounting for spillover effects from neighborhood is important since in a regional context, the labor market situation in neighboring regions is likely to affect the performance of the analyzed employment office area. Our suggested approach is illustrated based on quarterly data for 176 labor market regions in Germany during the time period of 2006 to 2008. Our outcome variable of interest is, similar to Blien et al. (2010), the rate of hirings into regular employment among the unemployed. We suggest a leave-one-out cross-validation procedure regarding the prediction of the outcome variable in order to find an optimal weighting scheme between spatial proximity and similarity in labor market characteristics. In a detailed sensitivity analysis, we investigate different specifications of the kernel functions and choose the preferred specification based on our cross-validation procedure. The implied weighting scheme provides a specific comparison group for each labor market region, which can be used to estimate the counterfactual distribution of outcomes and which we display graphically by means of maps for each region considered. The regions can be ranked regarding their actual outcome level based on the estimated counterfactual distribution. Our approach allows the dispersion of outcomes to vary by observed labor market characteristics. In addition, we provide region specific estimates of the absolute differences in counterfactual outcomes by quantile and the actual outcome in a region. An advantage of our approach is that it produces results on the matching quality indicating the extent to which a reliable benchmark for a specific region can be determined. For some regions, this does not seem feasible due to lack of common support. We provide a detailed sensitivity analysis regarding the specification of the matching approach. Overall, our application shows that the suggested approach can be implemented in a satisfactory way.

The remainder of the paper proceeds as follows. Section 2 reviews the literature on benchmarking analysis of labor market regions. Section 3 develops our benchmarking

[1]We use the terms 'performance', 'ranking', and 'benchmarking' of regions interchangeably. Doing so, we refer to relative or absolute differences in the outcome variable measured after controlling for exogenous labor market characteristics and spatial proximity. The benchmarking results (strictly speaking) only apply if we control for all the relevant exogenous labor market characteristics.

approach. The panel data on labor market regions in Germany are described in section 4. Section 5 discusses the empirical results. Section 6 concludes. The appendix provides further detailed empirical results.

2 Literature

A benchmarking analysis of labor market regions is required to assess the performance of regional employment offices, which act as local agents for a central government agency. Typically, the policy goal is to maximize the hiring (job finding) rate among the unemployed. A number of studies investigate the performance of regional employment offices regarding this goal based on a matching function for the local labor market. Analogous to a production process, the matching function explains hirings in a period as a function of the number of job seekers and the number of job openings (Blanchard and Diamond, 1989; Pissarides, 1990; Petrongolo and Pissarides, 2001). The benchmarking approach must take account of the fact that the level of hirings does not only depend upon the input factors mentioned above, but also on the prevailing conditions (frictions) within local labor markets.

The empirical literature mainly relies on two approaches for frontier efficiency measurement, namely the Stochastic Frontier Approach [SFA] (Battese and Coelli, 1995) and the Data Envelopment Analysis [DEA] (Gong and Sickles, 1992). Applications to measure the performance of regional employment offices build on a matching function and interpret the deviations from the estimated frontier as the degree of inefficiency. The two approaches differ with respect to the specification of the production technology and the measurement of technical efficiency. Furthermore, studies using SFA typically focus on a benchmarking analysis of local labor markets, whereas studies using DEA concentrate on measuring the efficiency of regional employment offices.

SFA uses a parametric Maximum Likelihood (ML) approach to estimate the production frontier model and to measure the implied inefficiency. Assumptions regarding the matching function and the specification of the inefficiency term are required. Typically, the matching function is assumed to follow a Cobb–Douglas function. The disturbance term is a mixture of two components. One component is assumed to be a random error term with expectation zero. The second component follows a strictly nonnegative distribution and represents the inefficiency relative to the implied production frontier, which is obtained by setting both error terms to zero. The first error term accounts for random variation of the outcome variable which is unrelated to the production frontier.

Several studies use SFA to estimate the matching efficiency of labor market regions, see for instance Ibourk et al. (2003) for France, Ilmakunnas and Pesola (2003) for Finland, Fahr and Sunde (2006) for West Germany, and Ramirez and Vassiliev (2007) for Switzerland. Based on regional panel data, all these studies aim to exploit variation in matching efficiency across regions and over time. The inefficiency term is specified as a function of the local labor market characteristics, such as the composition of the regional labor force with respect to age and education, GDP per capita, proportion of long-term unemployment spells, and others. Ilmakunnas and Pesola (2003) find evidence for spillover effects across regions when controlling for averages of unemployment and vacancy rates from neighboring regions. Fahr and Sunde (2006) also investigate the link between matching efficiency and spatial dependencies in the hiring rate. Their results suggest that the estimated spatial patterns are mostly stable over time, but exhibit strong spatial heterogeneity. Ramirez and Vassiliev (2007) analyze the public placement system in Switzerland. Unlike the studies cited so far, this study estimates explicitly the technical efficiency of local labor market authorities (employment offices). Technical efficiency involves two components: exogenous factors, which are not under the control of the employment office, and managerial inefficiency. The matching function also includes the number of job counselors as an input factor. The literature often treats this as a discretionary (endogenous) variable, which reflects the activity of the employment office (Sheldon, 2003), which makes it difficult to compare the efficiency across employment offices. Ramirez and Vassiliev (2007) find evidence for a strong impact of exogenous regional characteristics on technical efficiency. At the same time, there is considerable scope for improving the managerial efficiency of employment offices. The study does not account for spillover effects across adjacent regions.

DEA is a non-parametric method using linear programming techniques to detect best practices and to measure technical efficiency. DEA does not impose any restrictions on the functional form with respect to the frontier technology and the efficiency term, which is of particular importance when analyzing the performance of 'non-profit' organizations for which a well defined microeconomic objective function may not exist (Worthington, 2001). DEA only requires the output possibility set to be convex and monotone (Gong and Sickles (1992)). Comparing SFA and DEA, Gong and Sickles (1992) find that the performance of SFA depends crucially on the functional form assumptions regarding the underlying technology and that in case of a severe functional form misspecification, DEA is outperforming SFA. Furthermore, DEA allows the estimation of production frontier functions based on multiple outcomes in the case that the units of observation have multidimensional objectives. In DEA, efficiency of one unit is determined relative to the efficiency of all the other units in the sample. Efficient units lie on the production frontier and receive a score of one when there is no convex linear combination of other units that produce more output with the same amount of input factors. Units below the frontier function are regarded as technically inefficient and receive a score less than one. An important point emphasized by Sheldon (2003) is that efficient units in DEA may lack comparable units ('peers') and may therefore not serve as role models. The linear programming technique might then produce efficient units simply because of their uniqueness in the sample, possibly being oversensitive to outliers (Worthington, 2001). Addressing some of these problems, Sheldon (2003) eliminates the efficient unit from the reference group and computes a further score for efficient units based on 'second-best performers'. Another disadvantage of DEA is that it is a purely deterministic method.

Sheldon (2003) and Vassiliev et al. (2006) employ DEA to analyze the efficiency of regional employment offices for Switzerland. The two studies differ strongly in the specification of the frontier function. This refers mainly to the exogenous factors, like local environmental determinants, and to endogenous input factors such as the number of job counselors per employment office. Sheldon (2003) uses a two-step procedure. First, the relative matching efficiency of Swiss placement offices is measured using DEA, focusing solely on 'non-discretionary' factors (besides stocks of unemployed and vacancies, shares of unemployment composition with respect to age, gender, education etc.). Second, the estimated relative efficiency is regressed on 'discretionary' factors that are under the control of the employment office (e.g. number of job counselors, administrators, sanctioning actions per unemployed). The results suggest that Swiss regional employment offices reach only two thirds of their efficiency potential and that counseling is more effective to increase matching efficiency relative to other active labor market policies. Vassiliev et al. (2006) also use a two-step procedure, but proceed in a different way. The authors distinguish between two types of inputs – outcome variables that have to be optimized and resources of the employment office. First, only input factors that are under the control of the employment office are included. Second, the estimated efficiency scores are regressed on exogenous variables characterizing the local labor market situation. The estimated residuals from this regression are interpreted as residual efficiency scores measuring managerial performance. The study finds that regional labor market characteristics are significant determinants of the hiring rate and that there is significant scope for improving matching efficiency. However, neither of the studies account for possible spillover effects across regions.

While DEA and SFA attempt to estimate the efficiency relative to a fully specified production process, Blien et al. (2010) pursue a more modest goal. The study implements a cluster analysis of labor market regions, thus providing a benchmark based on similar regions. Specifically, the authors identify different types of labor market regions in Germany, where the spatial entities are represented by administrative units of the Federal Employment Service. Blien et al. (2010) use a two-step procedure, which results in a fixed predetermined number of groups (clusters) of regions. First, a regression estimating a matching function identifies significant exogenous determinants of the hiring rate and, subsequently, these determinants are weighted by their corresponding t-statistics. Second, the different groups of the labor market regions are identified by means of a clustering algorithm. This is based on the Euclidean distance in the weighted labor market characteristics which has been identified in the first step. The goal is to identify groups of regions with a high degree of homogeneity in exogenous labor market characteristics within the group. Blien et al. (2010) present results for 12 and 5 clusters, respectively, the so-called Comparison and Strategy types. The study does not provide a region specific comparison level, but a comparison to the mean outcome within the cluster is possible. The outcomes within a cluster provide an important benchmark in the controlling practice of the Federal Labor Agency (Bundesagentur für Arbeit) in Germany. Despite its usefulness, the approach has some disadvantages. First, Blien et al. (2010) determine the number of clusters a priori. Second, the outcome variable plays no role for the cluster analysis in the second step. Only the first step provides the link to the outcome variable when identifying the variables used in the cluster analysis. Third, Blien et al. (2010) do not take account of possible spillover effects across regions. Nevertheless, the estimated clusters often involve adjacent regions because of the similarity in observed characteristics.

3 New Benchmarking Approach

3.1 Conceptual Idea

Our benchmarking approach builds upon the matching function

(1) $H = A(w) \cdot f(U, V, \tilde{x})\,,$

where hirings (outflows) from unemployment into regular employment H are a function of the stock of unemployed (U), the stock of vacancies (V), and the efficiency parameter ($A(w)$). Furthermore, the matching function depends upon observables $\tilde{x}$ and unobservables w. The variables $\tilde{x}$ are intended to capture differences in regional and labor market characteristics like changes in the labor force composition or changes in the local economic structure. The variables $\tilde{x}$ also capture spillover effects from adjacent regions (e.g. working through the values of U or V in adjacent regions). We define the vector of labor market characteristics $x \equiv (U, V, \tilde{x})$ as the vector of all covariates considered in equation (1). x may involve lagged values of some variables. Analogous to Sheldon (2003) or Blien et al. (2010), we make the assumption that regions share a common matching technology but we remain agnostic regarding the precise functional form. Our benchmarking concept estimates the residual efficiency $A(w)$ in each region after controlling for interregional differences in observed characteristics. It should be noted that the residual efficiency term depends on the unobservable variables w and on random noise. The variables w might reflect the endogenous activities of the local labor agencies as well as unobserved determinants. In our benchmarking analysis, the outcome variable of interest is the hiring rate among the unemployed ($Y = H/U$), see section 4 for the data.

The conceptual idea of our benchmarking approach is to estimate in a flexible, non-parametric way the counterfactual distribution of outcomes Y_{rt} in region r at time t based on data for all other regions. The approach accounts both for similarity in exogenous labor market characteristics and for geographic proximity in order to identify comparable regions which serve as benchmark for region r. We argue that it is important to account both for labor market characteristics and geographic proximity because labor markets with similar characteristics are likely to show similar outcomes. Results in the existing literature also suggest that regions in closer geographical proximity share similar regional characteristics (Blien et al. (2010)). Thus, the geographical distance may serve as a proxy for unobserved labor market determinants. Furthermore, interregional dependencies (e.g. in form of interactions between different local institutions) and spillover effects may be limited by geographical distance, and they are expected to be much stronger for adjacent areas. More importantly, an unemployed person will be more likely to find a job in a region that is in the neighborhood to his/her region of residence, simply because of lower mobility and opportunity costs arising from spatial proximity. In contrast to the approach by Blien et al. (2010), who classify regions into a small number of groups, our benchmarking estimates are smooth functions in the variables considered, thus implying a region specific group of comparable (not necessarily equally weighted) regions.

The estimation of the conditional distribution of Y based on comparable regions - we denote this by conditioning on covariates x_{rt} - allows to measure the conditional quantile position for each region r at time t, $QP(y_{rt}|\mathbf{x}_{rt})$, based on the actual performance y_{rt}. This measure ranks each region based on the counterfactual distribution of labor market outcomes, thus providing a relative performance indicator and reflecting the relative scope for improvement. When $QP(y_{rt}|\mathbf{x}_{rt})$ is equal to 50%, the region is a median performer, i.e. half of the comparable regions show a better performance and half of them show a worse performance. Regions with a quantile position at the top of the distribution, $QP(y_{rt}|\mathbf{x}_{rt}) >> 50\%$, considerably outperform the reference group, whereas quantile positions at the bottom, $QP(y_{rt}|\mathbf{x}_{rt}) << 50\%$, show a clear underperformance. Our benchmarking approach allows for a ranking of regions regarding their relative performance. Our final results display regions with low ranks and others with high ranks. In addition to the rank measures, we could use the conditional expectation or conditional quantiles of the counterfactual distribution to provide reference points for an absolute performance indicator.

3.2 Formal Description

Assume that N is the number of regions in the sample with $r = 1, ..., N$ and $j \in N_{-r} \equiv \{1, ..., N\}\backslash r$, i.e. N_{-r} refers to the set of the first natural numbers up to N without r. Let Y_{rt} be the random outcome variable and y_{rt} the actual observed value in region r at time t, with $t = 1, ..., T$. The estimation of the expected conditional quantile position of region r at time t is based on a Nadaraya-Watson kernel regression of a dummy variable $I(y_{jt} \leq y_{rt})$ on the vector of labor market characteristics $\mathbf{x}_{rt}$ and spatial proximity of regions, for all $j \neq r$. The conditional quantile position is estimated by

$$(2) \quad \widehat{QP(y_{rt}|\mathbf{x}_{rt})} = \sum_{j \in N_{-r}} w(j, r, t) I(y_{jt} \leq y_{rt}),$$

where $I(\cdot)$ denotes the indicator function taking the value of 1, if $y_{jt} \leq y_{rt}$, and 0 otherwise. $w(j, r, t)$ represents the weight function measuring the similarity of region $j \in N_{-r}$ to region r. Analogous to a kernel-based matching approach in the program evaluation literature (Imbens, 2004), the weights are defined based on the kernel function $K(\cdot)$ as

$$(3) \quad w(j, r, t) = \frac{K(j, r, t)}{\sum_{j \in N_{-r}} K(j, r, t)} .$$

The weights $w(j,r,t)$ account for the similarity of regions with respect to labor market characteristics and spatial proximity. The two dimensions are captured by a two-dimensional product kernel $K(\cdot)$. Using a leave-one-out estimation approach, we exclude region r from the estimation of the counterfactual. The definition in equation (3) ensures that the weights $w(\cdot)$ sum up to one when region r is omitted.

We implement the following two alternative definitions of the kernel function regarding spatial proximity:

(4a) $K(j,r,t) = exp\left[-\frac{D_{\mathbf{x}}}{h_m^2}\right] \cdot exp\left[-(\frac{d_{j,r}}{h_d})^2\right]$ and

(4b) $$K(j,r,t) = exp\left[-\frac{D_{\mathbf{x}}}{h_m^2}\right] \cdot \left[1 + (\frac{rp_{j,r}}{h_d})^2\right].$$

In both cases, the first dimension containing $D_{\mathbf{x}}$ captures regional differences in labor market characteristics. The second dimension reflects the spatial proximity. In equation (4a), spatial proximity is measured by the geographical distance $d_{j,r}$ and a Gaussian kernel function is used to downweight regions with a large spatial distance. Equation (4b) uses relative commuting flows $rp_{j,r}$ from region j to region r. When commuting flows are zero ($rp_{j,r} = 0$), the specification in equation (4b) implies that regions are only compared with regard to $D_{\mathbf{x}}$.

To account for differences in observable labor market characteristics, we implement in equations (5a)-(5d) four different distance measures $D_{\mathbf{x}}$ proposed in the literature (Imbens, 2004).

(5a) $D_{M,\mathbf{x}} = (\mathbf{x}_{jt} - \mathbf{x}_{rt})' \widehat{V}_{\mathbf{x}}^{-1} (\mathbf{x}_{jt} - \mathbf{x}_{rt})$

(5b) $D_{AI,\mathbf{x}} = (\mathbf{x}_{jt} - \mathbf{x}_{rt})' diag(\widehat{V}_{\mathbf{x}}^{-1}) \cdot (\mathbf{x}_{jt} - \mathbf{x}_{rt})$

(5c) $D_{Z,\mathbf{x}} = \sum_{k=1}^{K} (x_{kjt} - x_{krt})^2 \cdot \hat{\beta}_k^2$

(5d) $D_{I,\mathbf{x}} = (\mathbf{x}_{jt} - \mathbf{x}_{rt})' (\hat{\beta}_{\mathbf{x}} \hat{\beta}_{\mathbf{x}}' + \sigma_R^2 \widehat{V}_{\mathbf{x}}^{-1}/N)(\mathbf{x}_{jt} - \mathbf{x}_{rt})$

Equation (5a) defines the Mahalanobis distance to measure the similarity in labor market characteristics. The widely used Mahalanobis distance uses the inverse of the variance-covariance matrix in the $\mathbf{x}$-vector, $\widehat{V}^{-1}$, to standardize the differences in the covariates. Imbens (2004) points out that the Mahalanobis distance can produce bad matches when the correlation between the **x**-variables in the sample is high. To overcome this problem, Abadie and Imbens (2006) propose to use merely the diagonal matrix of the inverse of the variances of the covariates to standardize regional differences, as displayed in equation (5b) and henceforth denoted as AI-distance.

Both the Mahalanobis distance and the AI-distance have the drawback that all covariates receive the same weight, irrespective of their importance for predicting the outcome variable. This point is addressed by Zhao (2004), who focuses on the useful information contained in the covariate with regard to the explaining outcome variable. Zhao proposes to minimize the sum of the absolute deviations in the **x**-variables, weighted by their coefficient in the regression of the outcome variable on x. As a modified version of Zhao's distance measure, equation (5c) involves the squared deviations weighted by the squared coefficients - this modification simplifies the cross-validation procedure described below. Imbens (2004) suggests that the optimal distance measure involves a combination of the sample variance-covariance matrix and the outer product of regression coefficients obtained from the outcome regression. This is the fourth alternative considered in equation (5d), where σ_R^2 denotes the squared standard error from the outcome regression. As a caveat, note that the third and the fourth alternative result in biased estimates of the counterfactual outcomes, in the case that the outcome regression is misspecified (Imbens, 2004).

The weight function $w(\cdot)$ depends on two unknown bandwidth parameters h_m and h_d. h_m concerns the similarity of regions regarding labor market characteristics and h_d concerns the spatial proximity. A small value for a bandwidth implies that only a small number of close neighbors in the corresponding dimension can be used as the comparison group, while a large value implies that also distant regions are in the comparison groups. We suggest to choose optimal bandwidths based on a “leave-one-out cross validation” approach, which minimizes the squared prediction error in the outcome variable y_{rt}. Formally, we suggest to minimize

$$(6)\quad [\hat{h}_m, \hat{h}_d] = \underset{h_m, h_d}{\arg\min}\, CV(h_m, h_d) = \frac{1}{N \cdot T} \sum_{r=1}^{N} \sum_{t=1}^{T} (y_{rt} - \hat{y}_{-rt}(\mathbf{x}_{rt}))^2$$

with respect to h_m and h_d. Here, $\hat{y}_{-rt}(\mathbf{x}_{rt})$ denotes the Nadaraya-Watson estimator of y_{rt} when region r is omitted. Our implementation chooses the same optimal smoothing parameters for the entire sample period $t = 1, ..., T$. The objective function measures the mean squared error (MSE) of the prediction based on the comparable regions and the optimal smoothing parameters are chosen such that the benchmark regions, defined by the implied weighting scheme (equations 4a and 4b), allow for an optimal prediction of the outcome variable. Subsequently, we use the same bandwidths to estimate the conditional quantile position for each region.

The entire estimation approach is carried out using the econometric software package TSP Version 5.0. The optimal bandwidth parameters are determined by numerical optimization. First, we undertake a fine grid search to determine good starting values. Then, we use gradient based iteration methods (using the ML procedure in TSP). The robustness of the bandwidth choice is examined by means of alternative starting values. We only report the estimation results based on the optimal bandwidths.

4 Data and Descriptive Statistics

The German Federal Employment Agency (FEA) involves 178 regional employment offices (*Arbeitsagenturen*). These are the lowest regional units in the FEA organization with local policy authority and executive functions. The labor market reforms during the years 2002 to 2005 changed the organizational structure of the FEA (Jacobi and Kluve, 2007). These changes involved some decentralization of the decision–making process and a re-organization of the regional employment offices. The goals of the reforms were to improve the effectiveness of placement services and to increase the efficiency of the FEA. Furthermore, the reforms attempted to increase the transparency through the introduction of results-based accountability and controlling measures.

Our study uses panel data for 176 regional employment offices, as our labor market regions, during the time period from 2006 to 2008. Because of large commuting flows and the reorganization over time, we merge the three employment offices in Berlin into one region. The data set consists of quarterly averages, involving a total of 2112 ($\equiv 176 \times 12$) observations. The data are provided by the Institute for Employment Research (IAB) in Nuremberg.

The outcome variable of interest is the six-months rate of hirings into non-subsidized employment. It is defined as the number of unemployed people entering into a non-subsidized employment for more than six months relative to the stock of unemployed in the SGB III.[2] The hiring rate among the unemployed is a useful outcome variable in light

[2]Unemployed who receive benefits or services based on the Book III of the Social Code in Germany. These are typically individuals who have been unemployed for at most 12 months (or a period of at most

of the aforementioned matching function approach. In addition, increasing the hiring rate is generally considered to be a key goal of employment offices (Sheldon, 2003) and labor market policy in general (Blien et al., 2010). Increasing the hiring rate can be considered as one of the most direct ways for an employment agency to reduce unemployment and to shorten the average duration of unemployment spells (Vassiliev et al., 2006).

To account for spatial proximity, we use data on the geographical distance between the labor market regions (measured in km) and on rates of commuting flows calculated relative to the stock of employees at the place of work. The commuting flow data are available on an annual basis for the years 2006, 2007, and 2008. Both alternatives lead to the construction of a symmetric spatial weighting 176×176 matrix with zeroes on the main diagonal.

Labor market regions differ strongly regarding their labor market characteristics, which provides the setting under which employment offices operate. These labor market characteristics are therefore likely to affect the regional hiring rate. We take account of labor market characteristics that are, at least in the short run, exogenous for the activities of the regional employment office. The variables considered include the unemployment rate in the region, the labor force composition with respect to gender, education, and industry, degree of tertiarization, average wages, seasonal span (maximal seasonal difference) of unemployment, and population density. In addition, the share of non-subsidized vacancies relative to the number of unemployed in the corresponding region is used as a proxy for the regional labor market tightness. Moreover, the average regional separation rate is approximated by using the proportion of individuals entering unemployment for a given period of time. Unfortunately, we can not distinguish whether the unemployed enter from former employment or from out-of-labor-force.

Table 1 (Appendix A) reports descriptive statistics of the outcome variable and the labor market characteristics used in the analysis. Over the entire period (2006–2008), the average hiring rate among the unemployed is 11.9% (12.1% in West and 11.1% in East Germany, respectively). The lowest value is found for Sangerhausen (5.2% in 4th quarter 2006) and the highest value for Passau (44.8% in 2nd quarter 2006). On average, the hiring rate amounts to 10.8% in 2006, 12.3% in 2007, and 12.5% in 2008. In addition, there are noticeable cyclical fluctuations in the outcome variable with the maximum value always observed for the 2nd quarter of a year.

24 months for older unemployed).

5 Results

5.1 Regression Analysis

The first step of our benchmarking approach determines the regional labor market characteristics which are relevant for the outcome variable of interest. The specification of the regression follows a matching function approach. We pool all 2112 region-period observations and regress our outcome variable, the hiring rate, on a number of labor market characteristics. Furthermore, the specification involves quarterly dummies to control for seasonality. For the subsequent analysis, we calculate the performance measures for the quarterly data, but then only report annual averages. We consider two alternative model specifications: regression (1) represents the local economic and industry structure by employee shares, whereas regression (2) uses the degree of tertiarization described by the fraction of employees in the service sector. Our regressions are descriptive and they do not necessarily estimate causal effects. Their purpose is to identify labor market characteristics, which we think are exogenous (at least in the short run) and which have predictive power for the outcome variable of interest.

Table 2 (Appendix A) reports the results from pooled OLS regressions. It turns out that the estimated coefficients have the expected sign, in accordance with the results in Blien et al. (2010). For example, the unemployment rate, the proportion of females among the unemployed and employed, respectively, the relative unemployment inflow, and the log average wages show a negative association with the hiring rate. A positive association is found for the relative vacancy rate and the seasonal span of unemployment. Based on Wald tests for joint significance, we conclude from regression (1) that the labor force composition with respect to education and industry is significantly associated with the hiring rate. However, regression (2) does not yield significant results for education. We therefore exlude education in the subsequent matching analysis. Two further covariates prove to be insignificant – the East-West dummy and the population density. Despite these results, we consider the two variables to be important labor market characteristics and therefore we include them in the subsequent matching analysis.

5.2 Comparison of Regions and Bandwidth Choice

Based on matching with respect to the relevant labor market characteristics, we now determine the optimal bandwidth parameters which are need for the specification of the weight function. The cross-validation procedure is implemented both for the variables from regression (1) and regression (2).

Table 3 (Appendix A) reports the results from the cross-validation procedure for various specifications of the weighting function and summarizes the optimal bandwidths, the corresponding MSE, and the number of iterations required for convergence. To scrutinize the bandwidth choice by means of a detailed sensitivity analysis, we implement the following four specifications:

a) Regions are compared with each other only in terms of labor market characteristics (second term in equations (4a) and (4b) is omitted),

b) in addition to a), spatial proximity is taken into account and is measured by geographical distance,

c) in addition to a), spatial proximity is taken into account and is measured by the logarithm of geographical distance, and

d) in addition to a), spatial proximity is taken into account and is measured by relative commuting flows.

The results in Table 3 suggest that the specifications with the log geographical distance produce the lowest MSE, irrespective of the selected set of labor market characteristics ($\mathbf{x}$-variables) and the distance measure for $\mathbf{x}$ used. Table 3 also shows that the specification that ignores spatial proximity and compares regions only in terms of labor market characteristics is associated with a higher MSE compared to the other alternatives. This means that spatial proximity is important when matching regions - however, this only holds for geographical distance but not for commuting flows. With regard to the distance measures capturing differences in the labor market characteristics, a considerable improvement in the MSE criterion is achieved using the modified Zhao distance. Small differences are typically found between regression (1) and regression (2). Except for the results based on the Mahalanobis distance, the MSE is always lower for regression (1) than for regression (2).

The results in Table 3 show that the smallest MSE is obtained for the modified Zhao (2004) distance using the variables in regression (1) and the log geographic distance (this case is printed in bold face). For this specification, the cross-validation procedure determines the following bandwidths: $\widehat{h_m} = 0.0088495$ and $\widehat{h_d} = 2.59543$, with MSE $= 1.6536 \cdot 10^{-4}$. Unless stated otherwise, the results discussed in the following are based on this specification and the two associated optimal bandwidth parameters.

To investigate further whether the selected bandwidth parameters represent the global minimum within the plausible range of values, we plot the MSE for different bandwidth values in both dimensions (see Figure 1, Appendix B).[3] The graph to the left (to the right) in Figure 1 shows the shape of the cross-validation function for varying bandwidths of the spatial (statistical) distance for a given optimal value of the other bandwidth, i.e. $\widehat{h_m} = 0.0088495$ and $\widehat{h}_d = 2.59543$, respectively. In both dimensions, the MSE function proves to be strictly convex. This suggests that the proposed two-dimensional cross-validation procedure in fact detects the global optimum.

5.3 Spatial Distribution of Benchmark Weights

Our analysis estimates a benchmark of similar regions at any given point in time, where the benchmark is defined by means of the implied weighting scheme. Now, we address the following two questions: First, how does the spatial distribution of benchmark weights look like? Second, is the composition benchmark group composition stable or does it change over time? Figures 2.1 to 2.176 in Online Appendix C provide evidence to address these two questions.[4] Each figure refers to one region r and shows the implied weighting for the three years 2006, 2007, and 2008. Each map represents the spatial distribution of the average normalized weights $w(j, r, t)$ for regions $j \neq r$ in one year. The normalized weights define the comparison group and correspond to the weight of a region j in the benchmark for region r. The size of the weights is expressed by different shades of colors. Region r, for which the benchmark is estimated for, is represented by a right-angled grid. Regions with the highest weights are filled up with straight lines, while regions not in the benchmark group or with very low weight values are colored in white. Regions with a weight lower than 0.9 are marked by different shades of colors, with the color getting lighter the lower the weight.

The evidence in Online Appendix C yields the following general findings:

- For almost all regions in Germany, the benchmark with the highest weight lies in close proximity (see e.g. the central part of Lower-Saxony, the Ruhr area, and some part of Southern Germany). This is evidence for the existence of spillover effects

[3]The plausible range of values excludes small bandwidth values for whom underflow problems arise when calculating the weighting function.

[4]Because of the large file size, the Online Appendix C only presents results for selected regions `http://www.empiwifo.uni-freiburg.de/discussion-papers-1`. Results for the omitted regions are available upon request.

between adjacent regions. However, the maps also show that the weights are also driven by the similarity in labor market characteristics. The last point is particularly important in the case of large cities or metropolitan areas like Hamburg, Bremen, Hannover, Düsseldorf, Frankfurt, Cologne, and Munich. This suggests that large cities should be compared with large cities only (though the small weights suggest that the comparability of the benchmark regions is often small in thess cases) and not with adjacent rural regions. The latter finding is in accordance with the results in Blien et al. (2010).

- Regarding the importance of labor market characteristics, our results are driven by the distance measure used. To confirm this, Online Appendix D[5] shows the regional distribution of weights based on different distance measures for selected cases. It turns out that the modified Zhao distance and the AI–distance lead to similar results. The weights estimated with the Mahalanobis distance and the Imbens (2004) measure, however, are more strongly driven by geographic proximity.

- The maps suggest that a stable benchmark group can be found for most of the regions because we observe only slight changes of the weights over time. Furthermore, most of the changes in weights refer to benchmark regions with a weight lower than 0.1.

- The region-specific benchmarks differ regarding two aspects, namely the number of regions in the benchmark group (group size) and the strength of the benchmark weights. We both find cases with a small benchmark group size and relatively large weights (one weight larger than 0.5) and cases with a large benchmark group size and relatively small weights (less than 0.1)

- With the exception of Dresden and Potsdam, East German regions are benchmarked by East German regions. Furthermore, for West German regions at the border to East Germany, there are no comparable regions in East Germany. This result mainly reflects differences in the prevailing labor market characteristics.

In addition to the spatial distribution of benchmark weights, Tables 4 to 6 (Appendix A) show the ranking of the five nearest neighbors (as defined by the statistical distance measure) and their corresponding normalized weights. The last column reports the share of weights among the five nearest neighbors in the benchmark group - these are the five

[5]See http://www.empiwifo.uni-freiburg.de/discussion-papers-1.

most comparable regions. We find that this share varies considerably from one region to another region and that it mostly takes values larger than 50%. These results suggest that a small benchmark group of regions can be identified for most cases.

The results so far indicate that the benchmark groups differ considerably with respect to size and similarity of the benchmark group. We analyze this further by calculating for each region r the average of the total absolute values of the kernel function of equation (4a) over the entire period of 12 quarters $(1/12 \sum_{t=1}^{12} \sum_{j \in N_{-r}} K(j,r,t))$. We use this as an absolute measure of similarity of the benchmark group. Figure 3 (Appendix B) shows that regions with a relatively low similarity of the benchmark group are located in the North-East and the South-East of Germany. In addition, regions in Bavaria as well as large cities and metropolitan areas are also only partially comparable with other regions. On the other hand, the total sum of absolute weights proves to be substantially higher in West and Northwest Germany, in particular in the Ruhr area.

5.4 Quantile Position as a Relative Performance Indicator

Based on the optimal specification of the weighting function, we now estimate the conditional quantile position for each region and determine subsequently its performance relative to its benchmark group. The variance of estimated quantile positions is calculated in a first approximation based on the Bernoulli distribution and is given by

$$(7) \quad Var(\widehat{QP(y_{rt}|\mathbf{x}_{rt})}) = \sum_{j \in N_{-r}} w^2(j,r,t) \cdot \hat{F}_j(y_{rt}) \cdot (1 - \hat{F}_j(y_{rt})),$$

where $\hat{F}_j(y_{rt})$ is the estimated cumulative distribution function of the outcome in region j based on the outcome in region r.[6] This variance estimate only reflects the uncertainty in estimating the quantile position based on the counterfactual outcome distribution for given weights (note that the weights are normalized to sum up to one). It would be computationally infeasible to account for the estimation error in the weights.

We present the estimated quantile positions and their standard errors as annual averages. For each region, we report the estimated quantile positions and their standard errors, in Table 7 for 2006, in Table 8 for 2007, and in Table 9 for 2008 (Appendix A). In addition, Figure 4 (Appendix B) sorts the 176 regions according to their quantile position. The dotted lines represent the 90% confidence bands and demonstrate the reliability of

[6] More formally, $\hat{F}_j(y_{rt}) = \frac{\sum_{j,l \in N_{-r}} K(j,l,t) \cdot I(y_{lt} \leq y_{rt})}{\sum_{j,l \in N_{-r}} K(j,l,t)}$. It means that 175 values are calculated for each region r reflecting a total of 30,800 estimates.

the estimator. Quantile positions of less than 20% indicate a rather poor performance, i.e. these regions perform worse than 80% of their corresponding benchmark group. Correspondingly, the regions with a quantile position of more than 80% can be viewed as 'best-practice' regions. The performance of these regions in terms of the hiring rate lies above the performance of 80% of the comparable regions.

Figure 5 (Appendix B) shows the spatial distribution of the quantile positions. The quantile positions are classified into four groups and marked by different shades of colors. The 'best-practice' regions are grey, whereas the weakest performers are colored white. Blue refers to a relatively good and green to a relatively weak performance, respectively. Figure 5 shows the following general findings: (1) Regions in the upper and lower part of the outcome distribution are located mostly at state borders (*Bundeslandsgrenze*). (2) Based on the four classified groups, 56.8% of the regions do not change the group over time. Stability of the group is mainly observed for regions in East Germany, major parts of Bavaria, and in regions at the national border. (3) For 34 regions (19.3%), we observe an improvement in the quantile position by one group from 2006 to 2008, whereas a deterioration by one group is found for 36 regions (20.5%). These are primarily regions within Baden-Württemberg, Saarland, Rheinland-Pfalz, and Hesse. Recall that such changes often reflect changes relative to geographically adjacent regions.

5.5 Matching Quality

The benchmark group should be comparable with the region to be benchmarked regarding the labor market characteristics considered. We now investigate the quality of the matching of the labor market characteristics (**x**-variables) based on normalized absolute differences

$$(8) \quad diffs_{x_r} = \frac{1}{T}\sum_{t=1}^{T} \left|\frac{x_{rt} - \hat{x}_{-rt}}{\sigma_{x_t}}\right| \qquad with \quad \hat{x}_{-rt} = \frac{\sum_{j \in N_{-r}} K(j,r,t) \cdot x_{jt}}{\sum_{j \in N_{-r}} K(j,r,t)},$$

where σ_{x_t} denotes the sample standard deviation of explanatory variable x at time t. $diffs_{x_r}$ is calculated for each region r as a sample average over the entire sample period and shows the standardized absolute difference between observed and estimated values based on the benchmark group. Analogous to equation (6), $\hat{x}_{-rt}$ is the Nadaraya-Watson estimator of x_{rt}, where region r is not taken into account when x_{rt} is estimated for that region. We use the rule of thumb, that a mismatch in variable x for region r still exists after matching when $diffs_{x_r} \geq 1.645$, i.e. when the average standardized difference between observed and estimated value in variable x for that region exceeds the 90% critical value of the standard normal distribution.

Table 10 (Appendix A) presents descriptive statistics of the standardized differences of the set of covariates used in regression (1). The distribution of this mismatch indicator turns out to be strongly skewed to the right. In addition, the upper decile (90%-percentile) always takes values less than 1.645, i.e., a mismatch in one labor market determinant is observed only for at most 10% of all regions. In fact, the number of regions with a mismatch in labor market characteristics is much smaller and varies between 1 (e.g. population density) and 10 (share of employees in the mining sector). No mismatch was found for a total of 7 explanatory variables – unemployment rate, average wages, and seasonal span of unemployment among others. Based on these results, we conclude that the $\mathbf{x}$-variables are well balanced by our nonparametric matching approach, i.e. the implied benchmark groups are highly comparable with the region to be benchmarked.

5.6 Absolute Performance

As the final part of our analysis, we estimate the absolute performance of a region relative to its benchmark group. This allows us to assess the possible absolute scope for improvement and deterioration in the outcome variable.[7] For region r, the absolute performance is estimated as a difference between the observed outcome in that region and a reference point from the counterfactual outcome distribution. As our reference point, we use the median, which is estimated nonparametrically by means of a leave-one-out weighted median regression. Then, the absolute performance is given by

$$(9) \quad \widehat{AP(y_{rt}|\mathbf{x}_{rt})} = y_{rt} - Q_{\hat{Y}_{-rt}}(1/2 \mid \mathbf{x}_{rt}),$$

where $Q_{\hat{Y}_{-rt}}(1/2 \mid \mathbf{x}_{rt})$ represents the 50% quantile of the conditional outcome distribution. We apply the same weighted scheme as used for the calculation of conditional quantile positions. Consequently, the absolute performance indicator measures the deviations of the actually observed outcome of the labor agency in region r at time t from the estimated median outcome based on similarity in labor market characteristics and spatial proximity. Negative values indicate an underperformance, whereas positive values reveal overperformance. Analogous to the quantile positions, we estimate absolute performance for each quarter separately, but report only annual averages (see Table 11 (Appendix A)).

[7]We thank Joachim Möller for his suggestion to measure absolute performance as part of our analysis.

Figure 6 (Appendix B) shows the spatial distribution of absolute performance for the years 2006 to 2008. The indicator is grouped into five classes depicted by different shades of colors, with the color getting darker the better the performance. Compared to the results based on the quantile positions, the absolute performance measure shows a rather moderate change over time and stronger spatial dependency. Figure 7 reveals that almost half of the regions have an absolute performance of up to +/- half a percentage point (ppoint), i.e. the observed outcome differs by at most half a ppoint from the median of the counterfactual outcome distribution. In addition, the maps show that the extreme values in the conditional outcome distribution mostly reflect strong negative spatial dependencies. Basically, regions with a strong overperformance (a hiring rate of more than one ppoint above the estimated median) are located at the national border - and these regions are probably affected by regions across the border. Considering the development of the spatial distribution of absolute performance over time, we observe an improvement for a number of East German regions. In contrast, we find a deterioration of absolute performance in some other parts of Germany, e.g. in the Ruhr area.

6 Conclusions

This study proposes a new benchmarking approach to assess the labor market performance of a region. The approach uses nonparametric matching techniques without having to specify the entire production process. We suggest to estimate the conditional quantile position of a region as a relative performance measure based on the counterfactual conditional distribution of outcomes for a group of comparable regions. The similarity of regions is measured both in terms of exogenous labor market characteristics and spatial proximity. We implement different similarity measures capturing the heterogeneity in labor market characteristics, and we use two alternative definitions for spatial proximity. The new benchmarking approach is applied to 176 labor market regions in Germany for the period of 2006 to 2008. Our outcome variable of interest is the hiring rate among the unemployed. We implement a leave-one-out cross-validation procedure to choose the values of the bandwidth parameters. The results show that controlling for the labor market characteristics as well as for spatial proximity is quite important. The implied benchmark groups of similar regions and the estimated relative and absolute performance measure remain quite stable over time. The examination of the matching quality shows only a negligible number of cases with a mismatch in some of the labor market characteristics considered.

Benchmarking labor market regions is a useful tool for identifying 'best practices' as well as low matching efficiency in the labor market. The proposed approach satisfies this purpose by ranking each labor market region relative to the counterfactual distribution of outcomes based on comparable regions. However, our approach does not assess the reasons for the estimated performance measure. Thus, the approach presented here can be seen as a first step in evaluating the matching efficiency of labor market regions. Similar to Sheldon (2003), a next step could be to regress the estimated performance measure (relative or absolute) on factors that are under the control of the decision makers in the region (e.g. the employment office). This would shed more light on the determinants of the ranking of regions.

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Appendix A
Tables

Table 1: Descriptive statistics (2006–2008)

Variable	Mean	St.dev	Median	Min	Max
Rate of integration	0.1188	0.0437	0.1082	0.0524	0.4478
East-West dummy	0.1989	0.3992	0.0000	0.0000	1.0000
Unemployment rate	0.0992	0.0457	0.0896	0.0235	0.2789
Share of registered unemployed (SGB III) by age					
15–24 years old	0.1491	0.0296	0.1460	0.0698	0.2641
25–54 years old	0.6739	0.0349	0.6775	0.5283	0.7640
55–64 years old	0.1770	0.0282	0.1759	0.1003	0.2873
Share of registered female unemployed (SGB III)	0.5279	0.0536	0.5272	0.3131	0.6916
Share of female employed	0.4517	0.0326	0.4510	0.3628	0.5438
Share of employees by education					
Elementary and secondary school (without VT)	0.1419	0.0398	0.1463	0.0635	0.2511
High school without VT	0.0153	0.0078	0.0132	0.0049	0.0449
Elementary school with VT	0.5811	0.0642	0.5855	0.3836	0.7174
High school with VT	0.0394	0.0142	0.0360	0.0150	0.0925
Technical college	0.0324	0.0095	0.0307	0.0151	0.0764
University	0.0493	0.0237	0.0427	0.0195	0.1475
Education unknown	0.1405	0.0403	0.1327	0.0625	0.2756
Share of employees by sectors (NACE 2003)					
Agriculture, hunting and forestry	0.0140	0.0112	0.0094	0.0021	0.0635
Fishing	0.0001	0.0004	0.0000	0.0000	0.0039
Mining and quarrying	0.0049	0.0086	0.0020	0.0000	0.0649
Manufacturing	0.2714	0.0932	0.2660	0.0873	0.5449
Electricity, gas and water supply	0.0092	0.0046	0.0081	0.0024	0.0290
Construction	0.0634	0.0175	0.0617	0.0281	0.1244
Wholesale and retail trade	0.1485	0.0230	0.1465	0.0939	0.2365
Hotels and restaurants	0.0278	0.0120	0.0242	0.0124	0.1108
Transport, storage and communication	0.0528	0.0228	0.0473	0.0210	0.2409
Financial intermediation	0.0295	0.0149	0.0259	0.0118	0.1238
Real estate, renting and business activity	0.1104	0.0411	0.0998	0.0398	0.2571
Public administration and defense	0.0632	0.0193	0.0583	0.0296	0.1552
Education	0.0370	0.0171	0.0310	0.0123	0.0948
Health and social work	0.1252	0.0244	0.1236	0.0716	0.2111
Other community and service activities	0.0397	0.0137	0.0378	0.0170	0.1071
Private households with employed persons	0.0013	0.0006	0.0013	0.0001	0.0054
Others	0.0008	0.0024	0.0002	0.0000	0.0303
Degree of tertiarization	0.6367	0.0890	0.6359	0.3908	0.8525
Flow into unemployment (relative to employed)	0.0304	0.0136	0.0269	0.0098	0.1311
Non-subsidized vacancies (relative to unemployed SGB III)	0.3315	0.2004	0.2912	0.0209	1.7934
Average wages	80.2236	10.1086	80.8213	56.5464	109.8218
Seasonal span of unemployment	0.1672	0.0973	0.1434	0.0312	0.7300
Density of population	418.72	580.66	195.28	46.0911	3849.1543

Notes: Number of observations: 2112; number of regions: 176.

Table 2. Results of pooled OLS regression on degree of integration (2006–2008)

	Regression (1)		Regression (2)	
Variable	Coefficient	St.error	Coefficient	St.error
Constant	0.6697***	(0.09249)	0.6747***	(0.08773)
East-West dummy	0.0058	(0.00553)	0.0064	(0.00488)
Unemployment rate	−0.2527***	(0.03294)	−0.1497***	(0.03161)
Share of registered unemployed (SGB III) by age				
15–24 years old	−0.2099***	(0.03898)	−0.1455***	(0.03501)
55–64 years old	−0.1693***	(0.02899)	−0.1439***	(0.02528)
Share of registered female unemployed (SGB III)	−0.0468**	(0.01872)	−0.0514***	(0.01818)
Share of female employed	−0.1272***	(0.04676)	−0.0931**	(0.03710)
Share of employees by education†				
Elementary and secondary school (without VT))	−0.0560	(0.03545)	−0.0533	(0.03363)
High school without VT	0.1956	(0.31145)	0.1231	(0.33517)
High school with VT	−0.2355	(0.16146)	−0.2346	(0.17289)
Technical college	−0.2075*	(0.11047)	−0.1399	(0.10474)
University	−0.0683	(0.06046)	−0.0344	(0.05690)
Education unknown	0.0192	(0.02962)	0.0085	(0.02509)
Shares of employees by sectors (NACE 2003)‡				
Agriculture, hunting and forestry	0.0047	(0.11353)		
Fishing	7.1978***	(1.58827)		
Mining and quarrying	−0.0498	(0.06234)		
Electricity, gas and water supply	0.2948**	(0.14587)		
Construction	0.2768***	(0.07179)		
Wholesale and retail trade	−0.0795**	(0.03632)		
Hotels and restaurants	0.2023***	(0.06804)		
Transport, storage and communication	−0.0487*	(0.02566)		
Financial intermediation	0.1016*	(0.05747)		
Real estate, renting and business activity	0.0299	(0.03361)		
Public administration and defense	0.0695*	(0.03634)		
Education	0.1278*	(0.07106)		
Health and social work	0.0415	(0.04612)		
Other community and service activities	0.0298	(0.05960)		
Private households with employed persons	−1.7154	(1.40630)		
Others	0.1321	(0.25572)		
Degree of tertiarization			0.0360**	(0.01613)
Flow into unemployment (Share; Employed)	−0.9488***	(0.10721)	−1.0081***	(0.10606)
Non-subsidized vacancies (Share; Unemployed SGB III)	0.0326***	(0.00565)	0.0334***	(0.00574)
Average wages (in logarithm)	−0.0859***	(0.01880)	−0.0901***	(0.01869)
Seasonal span of unemployment	0.1223***	(0.00933)	0.1405***	(0.00889)
Density of population (in logarithm)	−0.0019	(0.00142)	−0.0053	(0.00125)
Quarter dummies	yes		yes	
$\bar{R}^2$	0.6724		0.6609	
Observations/Number of regions	2112/176		2112/176	

Notes: †Reference category: Elementary and secondary school (with VT); ‡Reference category: Manufacturing
Clustered standard errors in parentheses. ***, **, * significant at the 1%, 5%, and 10% level

Table 3. Cross validation results (2006–2008)

	Regression (1)				Regression (2)			
	$\widehat{h_m}$	$\widehat{h_d}$	MSE	Iterations	$\widehat{h_m}$	$\widehat{h_d}$	MSE	Iterations
Mahalanobis								
a) Labor market characteristics (LM)	1.81855		0.00036945	4	1.41555		0.00025107	4
b) LM characteristics and distance in km	2.43870	94.28793	0.00028293	8	1.37542	127.81997	0.00022122	10
c) LM characteristics and log of distance in km	2.43046	2.06229	0.00026786	9	1.42047	2.30594	0.00022127	9
d) LM characteristics and commuting flows	2.07574	0.0066073	0.00035683	7	1.14912	0.025822	0.00024132	7
Abadie/Imbens								
a) Labor market characteristics (LM)	3.39967		0.00024560	4	1.66303		0.00022441	4
b) LM characteristics and distance in km	4.33356	117.64171	0.00021869	10	2.16638	115.82898	0.00020908	10
c) LM characteristics and log of distance in km	4.31866	2.26724	0.00021301	9	2.26041	2.17108	0.00020589	8
d) LM characteristics and commuting flows	3.56068	0.016449	0.00023279	7	1.76721	0.025599	0.00021748	8
Zhao squared								
a) Labor market characteristics (LM)	0.0075363		0.00017847	6	0.0073953		0.00018341	6
b) LM characteristics and distance in km	0.0090026	143.25383	0.00016987	10	0.0083086	140.47555	0.00017007	18
c) LM characteristics and log of distance in km	**0.0088495**	**2.59543**	**0.00016536**	**10**†	0.0086232	2.56764	0.00016796	18
d) LM characteristics and commuting flows	0.0079269	0.024570	0.00017298	10	0.0081169	0.025578	0.00017683	9
Imbens								
a) Labor market characteristics (LM)	0.0091419		0.00026480	3	0.0097173		0.00028959	4
b) LM characteristics and distance in km	0.010594	105.10885	0.00019918	9	0.013952	80.55418	0.00021740	14
c) LM characteristics and log of distance in km	0.012979	1.99260	0.00018021	8	0.014013	1.90471	0.00020989	8
d) LM characteristics and commuting flows	0.011920	0.0071870	0.00023395	7	0.010884	0.0085352	0.00025613	8

Notes: These are the results from optimization of the cross validation function implemented in TSP using the ML-command. To check the robustness of the maximum likelihood estimation procedure we implement also a grid search algorithm in two dimensions. The grid search method yields the same results as the ML-command. Only in the case where labor market characteristics from Regression (1) are captured by the modified Zhao distance metric and spatial proximity is defined through the geographical distance we get slightly different bandwidths and somewhat smaller MSE ($\widehat{h_m} = 0.00885$, $\widehat{h_d} = 143.9999$, and $MSE = 0.00016984$).

†As a final robustness check for the best specification we split our sample and use only a part of the observations (e.g. year 2006) for selecting the smoothing parameters. The estimated bandwidths change a bit using observations only for 2006 ($\widehat{h_m} = 0.0083188$, $\widehat{h_d} = 2.88868$); for 2007 ($\widehat{h_m} = 0.0088151$, $\widehat{h_d} = 2.61365$); for 2008 ($\widehat{h_m} = 0.0095086$, $\widehat{h_d} = 2.38983$); for 2006 and 2007 ($\widehat{h_m} = 0.0085035$, $\widehat{h_d} = 2.76152$); for 2007 and 2008 ($\widehat{h_m} = 0.0092199$, $\widehat{h_d} = 2.47166$).

Table 4. Estimated benchmark groups (average for 2006); 5 nearest neighbors and normalized weights in brackets

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
31 Neubrandenburg	36 Eberswalde *(0,5196)*	48 Stendal *(0,0727)*	37 Frankfurt/Oder *(0,0596)*	72 Bautzen *(0,0563)*	47 Sangerhausen *(0,0559)*	76,41
32 Rostock	33 Schwerin *(0,3849)*	45 Magdeburg *(0,1493)*	38 Neuruppin *(0,0700)*	42 Dessau *(0,0618)*	37 Frankfurt/Oder *(0,0585)*	72,45
33 Schwerin	45 Magdeburg *(0,2580)*	32 Rostock *(0,2473)*	38 Neuruppin *(0,1181)*	37 Frankfurt/Oder *(0,0751)*	48 Stendal *(0,0510)*	74,95
34 Stralsund	31 Neubrandenburg *(0,8994)*	32 Rostock *(0,0733)*	37 Frankfurt/Oder *(0,0140)*	36 Eberswalde *(0,0061)*	33 Schwerin *(0,0026)*	99,54
35 Cottbus	46 Merseburg *(0,1737)*	37 Frankfurt/Oder *(0,1276)*	42 Dessau *(0,1204)*	49 Wittenberg *(0,1142)*	79 Riesa *(0,1093)*	64,52
36 Eberswalde	31 Neubrandenburg *(0,2317)*	37 Frankfurt/Oder *(0,1821)*	38 Neuruppin *(0,1678)*	72 Bautzen *(0,0703)*	48 Stendal *(0,0632)*	71,51
37 Frankfurt/Oder	38 Neuruppin *(0,1753)*	36 Eberswalde *(0,1176)*	35 Cottbus *(0,1033)*	79 Riesa *(0,0812)*	49 Wittenberg *(0,0708)*	54,82
38 Neuruppin	48 Stendal *(0,1550)*	37 Frankfurt/Oder *(0,1320)*	43 Halberstadt *(0,0944)*	49 Wittenberg *(0,0879)*	36 Eberswalde *(0,0750)*	54,43
39 Potsdam	44 Halle *(0,1998)*	93 Erfurt *(0,1454)*	45 Magdeburg *(0,1108)*	96 Jena *(0,0911)*	271 Uelzen *(0,0899)*	63,70
42 Dessau	45 Magdeburg *(0,1671)*	49 Wittenberg *(0,1506)*	44 Halle *(0,1058)*	35 Cottbus *(0,0702)*	46 Merseburg *(0,0663)*	56,00
43 Halberstadt	49 Wittenberg *(0,1291)*	94 Gera *(0,1052)*	97 Nordhausen *(0,0942)*	95 Gotha *(0,0916)*	38 Neuruppin *(0,0881)*	50,82
44 Halle	93 Erfurt *(0,2127)*	75 Leipzig *(0,2021)*	45 Magdeburg *(0,1352)*	73 Chemnitz *(0,1147)*	42 Dessau *(0,0947)*	75,94
45 Magdeburg	44 Halle *(0,1545)*	42 Dessau *(0,1515)*	33 Schwerin *(0,1331)*	96 Jena *(0,0747)*	93 Erfurt *(0,0626)*	57,64
46 Merseburg	70 Altenburg *(0,1455)*	35 Cottbus *(0,1389)*	42 Dessau *(0,0973)*	49 Wittenberg *(0,0827)*	79 Riesa *(0,0724)*	53,68
47 Sangerhausen	70 Altenburg *(0,2502)*	46 Merseburg *(0,1766)*	49 Wittenberg *(0,1214)*	43 Halberstadt *(0,1091)*	97 Nordhausen *(0,0654)*	72,27
48 Stendal	38 Neuruppin *(0,2460)*	76 Oschatz *(0,1227)*	43 Halberstadt *(0,0711)*	45 Magdeburg *(0,0660)*	36 Eberswalde *(0,0521)*	55,79
49 Wittenberg	42 Dessau *(0,1476)*	43 Halberstadt *(0,1175)*	70 Altenburg *(0,1007)*	79 Riesa *(0,1004)*	76 Oschatz *(0,0743)*	54,05
70 Altenburg	76 Oschatz *(0,1782)*	49 Wittenberg *(0,1387)*	46 Merseburg *(0,1346)*	47 Sangerhausen *(0,0776)*	92 Zwickau *(0,0683)*	59,74
71 Annaberg-B.	76 Oschatz *(0,3700)*	97 Nordhausen *(0,2599)*	72 Bautzen *(0,1752)*	70 Altenburg *(0,0674)*	78 Plauen *(0,0392)*	91,17
72 Bautzen	77 Pirna *(0,1613)*	70 Altenburg *(0,1390)*	76 Oschatz *(0,1367)*	35 Cottbus *(0,0705)*	70 Altenburg *(0,0697)*	57,72
73 Chemnitz	92 Zwickau *(0,6500)*	44 Halle *(0,1277)*	96 Jena *(0,0610)*	93 Erfurt *(0,0605)*	45 Magdeburg *(0,0201)*	91,93
74 Dresden	39 Potsdam *(0,3489)*	75 Leipzig *(0,1612)*	900 Berlin *(0,1541)*	93 Erfurt *(0,0476)*	131 Kiel *(0,0458)*	75,76
75 Leipzig	44 Halle *(0,5041)*	93 Erfurt *(0,3186)*	73 Chemnitz *(0,0426)*	45 Magdeburg *(0,0280)*	39 Potsdam *(0,0203)*	91,36
76 Oschatz	79 Riesa *(0,1670)*	70 Altenburg *(0,1374)*	97 Nordhausen *(0,1232)*	72 Bautzen *(0,0987)*	49 Wittenberg *(0,0807)*	60,70
77 Pirna	79 Riesa *(0,2295)*	72 Bautzen *(0,1851)*	76 Oschatz *(0,1263)*	94 Gera *(0,0994)*	78 Plauen *(0,0659)*	70,62
78 Plauen	94 Gera *(0,4640)*	98 Suhl *(0,1785)*	95 Gotha *(0,0553)*	76 Oschatz *(0,0497)*	77 Pirna *(0,0380)*	78,55
79 Riesa	76 Oschatz *(0,1294)*	49 Wittenberg *(0,1217)*	77 Pirna *(0,1080)*	94 Gera *(0,0954)*	35 Cottbus *(0,0778)*	53,23
92 Zwickau	73 Chemnitz *(0,6592)*	70 Altenburg *(0,0533)*	96 Jena *(0,0398)*	44 Halle *(0,0374)*	78 Plauen *(0,0320)*	82,17
93 Erfurt	96 Jena *(0,3299)*	44 Halle *(0,2214)*	75 Leipzig *(0,1208)*	73 Chemnitz *(0,0645)*	45 Magdeburg *(0,0590)*	79,56
94 Gera	78 Plauen *(0,2419)*	98 Suhl *(0,1322)*	95 Gotha *(0,1134)*	96 Jena *(0,0858)*	43 Halberstadt *(0,0719)*	64,52
95 Gotha	98 Suhl *(0,2774)*	94 Gera *(0,1932)*	96 Jena *(0,1567)*	43 Halberstadt *(0,0930)*	78 Plauen *(0,0448)*	76,51
96 Jena	93 Erfurt *(0,3297)*	95 Gotha *(0,1405)*	94 Gera *(0,1277)*	44 Halle *(0,0737)*	45 Magdeburg *(0,0719)*	74,35
97 Nordhausen	76 Oschatz *(0,3323)*	43 Halberstadt *(0,1828)*	48 Stendal *(0,0699)*	49 Wittenberg *(0,0627)*	70 Altenburg *(0,0543)*	70,20
98 Suhl	95 Gotha *(0,3255)*	94 Gera *(0,2728)*	78 Plauen *(0,2286)*	96 Jena *(0,0497)*	77 Pirna *(0,0290)*	90,56
111 Bad Oldesloe	115 Elmshorn *(0,3516)*	139 Neumünster *(0,1414)*	251 Lüneburg *(0,0575)*	264 Osnabrück *(0,0404)*	261 Oldenburg *(0,0370)*	62,79
115 Elmshorn	111 Bad Oldesloe *(0,2287)*	261 Oldenburg *(0,1050)*	139 Neumünster *(0,0874)*	267 Stade *(0,0636)*	131 Kiel *(0,0548)*	53,95
119 Flensburg	127 Heide *(0,2497)*	135 Lübeck *(0,1952)*	271 Uelzen *(0,1069)*	139 Neumünster *(0,0921)*	281 Wilhelmshaven *(0,0766)*	72,05
123 Hamburg	214 Bremen *(0,5827)*	237 Hannover *(0,1915)*	357 Köln *(0,0840)*	337 Düsseldorf *(0,0644)*	419 Frankfurt *(0,0125)*	93,51
127 Heide	119 Flensburg *(0,4352)*	224 Emden *(0,2227)*	267 Stade *(0,1766)*	281 Wilhelmshaven *(0,0373)*	271 Uelzen *(0,0351)*	90,69
131 Kiel	115 Elmshorn *(0,1023)*	135 Lübeck *(0,0958)*	435 Kassel *(0,0678)*	261 Oldenburg *(0,0646)*	139 Neumünster *(0,0527)*	38,32
135 Lübeck	119 Flensburg *(0,2394)*	131 Kiel *(0,1434)*	281 Wilhelmshaven *(0,1046)*	271 Uelzen *(0,0962)*	261 Oldenburg *(0,0688)*	65,24
139 Neumünster	251 Lüneburg *(0,1383)*	261 Oldenburg *(0,1117)*	277 Verden *(0,1014)*	267 Stade *(0,0906)*	221 Celle *(0,0866)*	52,86
211 Braunschweig	237 Hannover *(0,1422)*	435 Kassel *(0,1396)*	317 Bielefeld *(0,0820)*	214 Bremen *(0,0594)*	383 Soest *(0,0588)*	48,20
214 Bremen	237 Hannover *(0,3192)*	123 Hamburg *(0,1241)*	211 Braunschweig *(0,1006)*	317 Bielefeld *(0,0711)*	321 Bochum *(0,1391)*	75,41

(continued)

Table 4. Estimated benchmark groups (average for 2006); 5 nearest neighbors and normalized weights in brackets (continued)

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
217 Bremerhaven	281 Wilhelmshaven *(0,2863)*	267 Stade *(0,2602)*	261 Oldenburg *(0,0926)*	127 Heide *(0,0597)*	375 Recklinghausen *(0,0466)*	74,54
221 Celle	244 Hildesheim *(0,1447)*	251 Lüneburg *(0,0952)*	254 Nienburg *(0,0793)*	261 Oldenburg *(0,0756)*	139 Neumünster *(0,0592)*	45,40
224 Emden	127 Heide *(0,8672)*	119 Flensburg *(0,0410)*	247 Leer *(0,0269)*	281 Wilhelmshaven *(0,0157)*	267 Stade *(0,0122)*	96,30
227 Goslar	231 Göttingen *(0,4833)*	234 Hameln *(0,1664)*	244 Hildesheim *(0,1164)*	331 Detmold *(0,0255)*	271 Uelzen *(0,0235)*	81,51
231 Göttingen	227 Goslar *(0,3180)*	234 Hameln *(0,1416)*	244 Hildesheim *(0,0915)*	331 Detmold *(0,0848)*	435 Kassel *(0,0740)*	70,99
234 Hameln	244 Hildesheim *(0,2288)*	331 Detmold *(0,2233)*	231 Göttingen *(0,1267)*	227 Goslar *(0,1071)*	221 Celle *(0,0400)*	72,59
237 Hannover	214 Bremen *(0,3395)*	211 Braunschweig *(0,2522)*	317 Bielefeld *(0,0635)*	357 Köln *(0,0494)*	123 Hamburg *(0,0475)*	75,21
241 Helmstedt	211 Braunschweig *(0,6103)*	381 Siegen *(0,0545)*	355 Iserlohn *(0,0438)*	523 Ludwigshafen *(0,0415)*	317 Bielefeld *(0,0393)*	78,94
244 Hildesheim	234 Hameln *(0,1959)*	331 Detmold *(0,1520)*	221 Celle *(0,1069)*	231 Göttingen *(0,0680)*	227 Goslar *(0,0574)*	58,02
247 Leer	274 Vechta *(0,8383)*	224 Emden *(0,0764)*	257 Nordhorn *(0,0331)*	751 Weiden *(0,0085)*	277 Verden *(0,0074)*	96,37
251 Lüneburg	221 Celle *(0,2087)*	139 Neumünster *(0,1897)*	271 Uelzen *(0,1718)*	277 Verden *(0,0674)*	254 Nienburg *(0,0653)*	70,29
254 Nienburg	277 Verden *(0,1906)*	261 Oldenburg *(0,1194)*	221 Celle *(0,1087)*	377 Rheine *(0,0708)*	251 Lüneburg *(0,0413)*	53,08
257 Nordhorn	377 Rheine *(0,3849)*	327 Coesfeld *(0,1774)*	277 Verden *(0,0569)*	423 Fulda *(0,0287)*	535 Montabaur *(0,0251)*	67,30
261 Oldenburg	281 Wilhelmshaven *(0,2486)*	139 Neumünster *(0,0618)*	221 Celle *(0,0607)*	267 Stade *(0,0516)*	115 Elmshorn *(0,0486)*	47,13
264 Osnabrück	353 Herford *(0,1953)*	377 Rheine *(0,1490)*	313 Ahlen *(0,0864)*	331 Detmold *(0,0579)*	317 Bielefeld *(0,0570)*	54,56
267 Stade	261 Oldenburg *(0,1615)*	139 Neumünster *(0,1561)*	221 Celle *(0,1162)*	115 Elmshorn *(0,0924)*	127 Heide *(0,0619)*	58,81
271 Uelzen	251 Lüneburg *(0,2791)*	221 Celle *(0,1145)*	119 Flensburg *(0,1083)*	135 Lübeck *(0,0726)*	227 Goslar *(0,0566)*	63,12
274 Vechta	247 Leer *(0,8229)*	851 Pfarrkirchen *(0,0467)*	563 Trier *(0,0441)*	257 Nordhorn *(0,0258)*	711 Ansbach *(0,0130)*	95,26
277 Verden	254 Nienburg *(0,1743)*	139 Neumünster *(0,1300)*	261 Oldenburg *(0,0836)*	221 Celle *(0,0806)*	251 Lüneburg *(0,0627)*	53,11
281 Wilhelmshaven	261 Oldenburg *(0,5260)*	234 Hameln *(0,0540)*	221 Celle *(0,0355)*	119 Flensburg *(0,0354)*	135 Lübeck *(0,0328)*	68,38
311 Aachen	361 Krefeld *(0,1390)*	335 Düren *(0,0789)*	375 Recklinghausen *(0,0775)*	321 Bochum *(0,0769)*	371 Oberhausen *(0,0604)*	43,27
313 Ahlen	383 Soest *(0,1270)*	317 Bielefeld *(0,1129)*	264 Osnabrück *(0,1028)*	377 Rheine *(0,1026)*	327 Coesfeld *(0,0960)*	54,13
315 Bergisch Gladb.	347 Hagen *(0,1870)*	365 Mönchengladb. *(0,1164)*	361 Krefeld *(0,1046)*	355 Iserlohn *(0,0728)*	391 Wuppertal *(0,0895)*	57,03
317 Bielefeld	383 Soest *(0,2075)*	313 Ahlen *(0,0965)*	353 Herford *(0,0733)*	331 Detmold *(0,0728)*	264 Osnabrück *(0,0581)*	50,83
321 Bochum	391 Wuppertal *(0,1696)*	333 Dortmund *(0,1607)*	347 Hagen *(0,1267)*	343 Essen *(0,1155)*	371 Oberhausen *(0,1006)*	67,31
323 Bonn	527 Mainz *(0,1821)*	459 Wiesbaden *(0,1352)*	367 Münster *(0,0608)*	415 Darmstadt *(0,0590)*	624 Heidelberg *(0,0564)*	49,36
325 Brühl	335 Düren *(0,4035)*	365 Mönchengladb. *(0,2380)*	315 Bergisch Gladb. *(0,1042)*	371 Oberhausen *(0,0519)*	361 Krefeld *(0,0345)*	83,22
327 Coesfeld	377 Rheine *(0,3611)*	313 Ahlen *(0,1415)*	547 Neuwied *(0,0858)*	264 Osnabrück *(0,0682)*	257 Nordhorn *(0,0514)*	70,79
331 Detmold	353 Herford *(0,1956)*	373 Paderborn *(0,1230)*	234 Hameln *(0,0881)*	244 Hildesheim *(0,0804)*	383 Soest *(0,0756)*	56,26
333 Dortmund	321 Bochum *(0,3647)*	343 Essen *(0,1467)*	345 Gelsenkirchen *(0,1347)*	341 Duisburg *(0,0811)*	371 Oberhausen *(0,0622)*	78,94
335 Düren	325 Brühl *(0,2307)*	385 Solingen *(0,1596)*	347 Hagen *(0,0976)*	311 Aachen *(0,0803)*	361 Krefeld *(0,0653)*	63,34
337 Düsseldorf	357 Köln *(0,7925)*	419 Frankfurt *(0,0601)*	343 Essen *(0,0217)*	365 Mönchengladb. *(0,0205)*	123 Hamburg *(0,0146)*	90,94
341 Duisburg	321 Bochum *(0,2281)*	391 Wuppertal *(0,1761)*	371 Oberhausen *(0,1568)*	343 Essen *(0,1204)*	333 Dortmund *(0,1168)*	79,82
343 Essen	321 Bochum *(0,3117)*	333 Dortmund *(0,1763)*	371 Oberhausen *(0,1404)*	391 Wuppertal *(0,1389)*	341 Duisburg *(0,0977)*	86,50
345 Gelsenkirchen	371 Oberhausen *(0,2713)*	321 Bochum *(0,2005)*	333 Dortmund *(0,1874)*	375 Recklinghausen *(0,1825)*	341 Duisburg *(0,0809)*	92,25
347 Hagen	385 Solingen *(0,1985)*	391 Wuppertal *(0,1531)*	321 Bochum *(0,0982)*	361 Krefeld *(0,0834)*	355 Iserlohn *(0,0755)*	60,87
351 Hamm	383 Soest *(0,2185)*	375 Recklinghausen *(0,1802)*	347 Hagen *(0,0968)*	331 Detmold *(0,0529)*	361 Krefeld *(0,0427)*	59,11
353 Herford	331 Detmold *(0,2444)*	264 Osnabrück *(0,1335)*	373 Paderborn *(0,0713)*	383 Soest *(0,0658)*	317 Bielefeld *(0,0558)*	57,09
355 Iserlohn	347 Hagen *(0,1807)*	383 Soest *(0,1406)*	385 Solingen *(0,1042)*	315 Bergisch Gladb. *(0,0887)*	381 Siegen *(0,0804)*	59,45
357 Köln	337 Düsseldorf *(0,7111)*	343 Essen *(0,0715)*	237 Hannover *(0,0409)*	391 Wuppertal *(0,0280)*	123 Hamburg *(0,0161)*	86,77
361 Krefeld	365 Mönchengladb. *(0,2048)*	347 Hagen *(0,1467)*	315 Bergisch Gladb. *(0,0719)*	385 Solingen *(0,0672)*	383 Soest *(0,0474)*	53,81
363 Meschede	439 Korbach *(0,3015)*	373 Paderborn *(0,0755)*	381 Siegen *(0,0595)*	455 Wetzlar *(0,0557)*	353 Herford *(0,0453)*	53,76
365 Mönchengladb.	361 Krefeld *(0,3110)*	315 Bergisch Gladb. *(0,1215)*	391 Wuppertal *(0,1136)*	347 Hagen *(0,0870)*	325 Brühl *(0,0719)*	70,49
367 Münster	323 Bonn *(0,4586)*	317 Bielefeld *(0,1466)*	459 Wiesbaden *(0,0842)*	237 Hannover *(0,0563)*	624 Heidelberg *(0,0534)*	79,90

(continued)

Table 4. Estimated benchmark groups (average for 2006); 5 nearest neighbors and normalized weights in brackets (continued)

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
371 Oberhausen	321 Bochum *(0,1848)*	345 Gelsenkirchen *(0,1758)*	343 Essen *(0,0929)*	341 Duisburg *(0,0886)*	375 Recklinghausen *(0,0819)*	62,39
373 Paderborn	331 Detmold *(0,2277)*	353 Herford *(0,1080)*	313 Ahlen *(0,0805)*	383 Soest *(0,0798)*	317 Bielefeld *(0,0652)*	56,12
375 Recklinghausen	351 Hamm *(0,2151)*	345 Gelsenkirchen *(0,1571)*	371 Oberhausen *(0,1051)*	321 Bochum *(0,0952)*	387 Wesel *(0,0644)*	63,69
377 Rheine	327 Coesfeld *(0,3071)*	264 Osnabrück *(0,2011)*	313 Ahlen *(0,1157)*	257 Nordhorn *(0,0948)*	547 Neuwied *(0,0309)*	74,97
381 Siegen	455 Wetzlar *(0,3332)*	355 Iserlohn *(0,1313)*	363 Meschede *(0,0713)*	313 Ahlen *(0,0388)*	559 Saarlouis *(0,0351)*	60,97
383 Soest	317 Bielefeld *(0,1325)*	351 Hamm *(0,1303)*	355 Iserlohn *(0,0828)*	331 Detmold *(0,0793)*	347 Hagen *(0,0686)*	49,35
385 Solingen	347 Hagen *(0,3605)*	391 Wuppertal *(0,0979)*	355 Iserlohn *(0,0786)*	361 Krefeld *(0,0683)*	335 Düren *(0,0540)*	65,93
387 Wesel	375 Recklinghausen *(0,1147)*	361 Krefeld *(0,0952)*	327 Coesfeld *(0,0527)*	351 Hamm *(0,0466)*	371 Oberhausen *(0,0449)*	35,40
391 Wuppertal	347 Hagen *(0,2438)*	321 Bochum *(0,2066)*	385 Solingen *(0,0855)*	341 Duisburg *(0,0754)*	365 Mönchengladb. *(0,0738)*	68,51
411 Bad Hersfeld	439 Korbach *(0,1746)*	423 Fulda *(0,1373)*	443 Limburg *(0,0552)*	363 Meschede *(0,0524)*	231 Göttingen *(0,0409)*	46,04
415 Darmstadt	451 Offenbach *(0,2716)*	644 Mannheim *(0,1077)*	527 Mainz *(0,0956)*	523 Ludwigshafen *(0,0773)*	631 Karlsruhe *(0,0452)*	59,74
419 Frankfurt	337 Düsseldorf *(0,4340)*	677 Stuttgart *(0,3143)*	357 Köln *(0,0660)*	459 Wiesbaden *(0,0586)*	843 München *(0,0438)*	91,67
423 Fulda	431 Hanau *(0,1128)*	747 Schweinfurt *(0,0966)*	715 Aschaffenburg *(0,0848)*	439 Korbach *(0,0790)*	411 Bad Hersfeld *(0,0664)*	43,95
427 Gießen	431 Hanau *(0,1614)*	331 Detmold *(0,0639)*	435 Kassel *(0,0498)*	515 Kaiserslautern *(0,0485)*	244 Hildesheim *(0,0445)*	36,81
431 Hanau	715 Aschaffenburg *(0,1674)*	427 Gießen *(0,1241)*	423 Fulda *(0,0554)*	681 Tauberbischofsh. *(0,0528)*	543 Landau *(0,0495)*	44,92
435 Kassel	211 Braunschweig *(0,0882)*	383 Soest *(0,0869)*	331 Detmold *(0,0794)*	231 Göttingen *(0,0691)*	347 Hagen *(0,0653)*	38,88
439 Korbach	363 Meschede *(0,3687)*	411 Bad Hersfeld *(0,0794)*	423 Fulda *(0,0773)*	447 Marburg *(0,0693)*	231 Göttingen *(0,0288)*	62,35
443 Limburg	535 Montabaur *(0,2426)*	511 Bad Kreuznach *(0,1525)*	531 Mayen *(0,1106)*	547 Neuwied *(0,0817)*	427 Gießen *(0,0294)*	61,67
447 Marburg	439 Korbach *(0,3847)*	443 Limburg *(0,0694)*	363 Meschede *(0,0568)*	759 Würzburg *(0,0535)*	719 Bamberg *(0,0430)*	60,74
451 Offenbach	415 Darmstadt *(0,3607)*	644 Mannheim *(0,0674)*	361 Krefeld *(0,0508)*	315 Bergisch Gladb. *(0,0484)*	347 Hagen *(0,0407)*	56,80
455 Wetzlar	381 Siegen *(0,2233)*	547 Neuwied *(0,0562)*	313 Ahlen *(0,0482)*	355 Iserlohn *(0,0469)*	431 Hanau *(0,0421)*	41,67
459 Wiesbaden	527 Mainz *(0,3227)*	323 Bonn *(0,1475)*	644 Mannheim *(0,0826)*	415 Darmstadt *(0,0651)*	451 Offenbach *(0,0500)*	66,79
511 Bad Kreuznach	515 Kaiserslautern *(0,1658)*	547 Neuwied *(0,0989)*	551 Pirmasens *(0,0965)*	443 Limburg *(0,0907)*	543 Landau *(0,0571)*	50,91
515 Kaiserslautern	511 Bad Kreuznach *(0,1894)*	551 Pirmasens *(0,1871)*	539 Neunkirchen *(0,1457)*	543 Landau *(0,0898)*	547 Neuwied *(0,0622)*	67,42
519 Koblenz	759 Würzburg *(0,1283)*	511 Bad Kreuznach *(0,1037)*	527 Mainz *(0,0572)*	455 Wetzlar *(0,0548)*	531 Mayen *(0,0518)*	39,58
523 Ludwigshafen	415 Darmstadt *(0,2037)*	644 Mannheim *(0,1788)*	631 Karlsruhe *(0,0989)*	315 Bergisch Gladb. *(0,0599)*	555 Saarbrücken *(0,0473)*	58,87
527 Mainz	459 Wiesbaden *(0,1938)*	415 Darmstadt *(0,1814)*	323 Bonn *(0,1058)*	644 Mannheim *(0,0337)*	624 Heidelberg *(0,0254)*	54,01
531 Mayen	535 Montabaur *(0,1798)*	443 Limburg *(0,1633)*	511 Bad Kreuznach *(0,1190)*	547 Neuwied *(0,0597)*	719 Bamberg *(0,0536)*	57,54
535 Montabaur	443 Limburg *(0,4038)*	531 Mayen *(0,2232)*	547 Neuwied *(0,1237)*	511 Bad Kreuznach *(0,0685)*	563 Trier *(0,0508)*	87,00
539 Neunkirchen	515 Kaiserslautern *(0,1921)*	559 Saarlouis *(0,1895)*	555 Saarbrücken *(0,0832)*	543 Landau *(0,0733)*	547 Neuwied *(0,0523)*	59,04
543 Landau	715 Aschaffenburg *(0,0974)*	515 Kaiserslautern *(0,0787)*	647 Nagold *(0,0783)*	681 Tauberbischofsh. *(0,0644)*	539 Neunkirchen *(0,0602)*	37,90
547 Neuwied	511 Bad Kreuznach *(0,1215)*	327 Coesfeld *(0,0733)*	455 Wetzlar *(0,0729)*	515 Kaiserslautern *(0,0672)*	443 Limburg *(0,0591)*	39,39
551 Pirmasens	515 Kaiserslautern *(0,3207)*	511 Bad Kreuznach *(0,1962)*	543 Landau *(0,0856)*	539 Neunkirchen *(0,0458)*	443 Limburg *(0,0329)*	68,12
555 Saarbrücken	539 Neunkirchen *(0,2156)*	415 Darmstadt *(0,0534)*	523 Ludwigshafen *(0,0448)*	559 Saarlouis *(0,0441)*	347 Hagen *(0,0381)*	39,60
559 Saarlouis	539 Neunkirchen *(0,2616)*	543 Landau *(0,0723)*	455 Wetzlar *(0,0563)*	715 Aschaffenburg *(0,0489)*	431 Hanau *(0,0452)*	48,44
563 Trier	531 Mayen *(0,2604)*	535 Montabaur *(0,1813)*	519 Koblenz *(0,0949)*	747 Schweinfurt *(0,0595)*	831 Kempten *(0,0490)*	64,50
611 Aalen	671 Waiblingen *(0,2410)*	621 Göppingen *(0,1080)*	641 Ludwigsburg *(0,0983)*	684 Ulm *(0,0785)*	667 Rottweil *(0,0599)*	58,56
614 Balingen	651 Offenburg *(0,1517)*	647 Nagold *(0,1080)*	667 Rottweil *(0,0951)*	664 Reutlingen *(0,0665)*	687 Vill.-Schwenn. *(0,0639)*	48,52
617 Freiburg	637 Lörrach *(0,2192)*	687 Vill.-Schwenn. *(0,2032)*	664 Reutlingen *(0,1510)*	651 Offenburg *(0,1379)*	647 Nagold *(0,0407)*	75,20
621 Göppingen	641 Ludwigsburg *(0,2911)*	671 Waiblingen *(0,2474)*	627 Heilbronn *(0,1046)*	684 Ulm *(0,0786)*	611 Aalen *(0,0727)*	79,43
624 Heidelberg	631 Karlsruhe *(0,2544)*	644 Mannheim *(0,1827)*	415 Darmstadt *(0,1140)*	641 Ludwigsburg *(0,0559)*	664 Reutlingen *(0,0511)*	65,81
627 Heilbronn	641 Ludwigsburg *(0,2373)*	621 Göppingen *(0,1890)*	671 Waiblingen *(0,1506)*	631 Karlsruhe *(0,0478)*	611 Aalen *(0,0398)*	66,44
631 Karlsruhe	644 Mannheim *(0,2047)*	641 Ludwigsburg *(0,1264)*	624 Heidelberg *(0,1146)*	654 Pforzheim *(0,0660)*	671 Waiblingen *(0,0570)*	56,86
634 Konstanz	687 Vill.-Schwenn. *(0,1683)*	661 Ravensburg *(0,1616)*	684 Ulm *(0,1037)*	654 Pforzheim *(0,0712)*	647 Nagold *(0,0691)*	57,40

(continued)

Table 4. Estimated benchmark groups (average for 2006); 5 nearest neighbors and normalized weights in brackets (continued)

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
637 Lörrach	687 Vill.-Schwenn. *(0,3498)*	617 Freiburg *(0,1927)*	651 Offenburg *(0,1182)*	667 Rottweil *(0,0632)*	614 Balingen *(0,0458)*	76,97
641 Ludwigsburg	671 Waiblingen *(0,2674)*	621 Göppingen *(0,2450)*	627 Heilbronn *(0,1078)*	611 Aalen *(0,0560)*	631 Karlsruhe *(0,0504)*	72,66
644 Mannheim	631 Karlsruhe *(0,2432)*	415 Darmstadt *(0,1351)*	624 Heidelberg *(0,0949)*	523 Ludwigshafen *(0,0840)*	451 Offenbach *(0,0646)*	62,18
647 Nagold	651 Offenburg *(0,1915)*	654 Pforzheim *(0,1169)*	614 Balingen *(0,1111)*	543 Landau *(0,1023)*	681 Tauberbischofsh. *(0,0664)*	58,81
651 Offenburg	647 Nagold *(0,1365)*	687 Vill.-Schwenn. *(0,1159)*	614 Balingen *(0,1054)*	654 Pforzheim *(0,0659)*	637 Lörrach *(0,0613)*	48,50
654 Pforzheim	647 Nagold *(0,0932)*	671 Waiblingen *(0,0803)*	651 Offenburg *(0,0766)*	657 Rastatt *(0,0665)*	641 Ludwigsburg *(0,0583)*	37,48
657 Rastatt	641 Ludwigsburg *(0,1520)*	654 Pforzheim *(0,1075)*	621 Göppingen *(0,1021)*	684 Ulm *(0,0652)*	671 Waiblingen *(0,0625)*	48,94
661 Ravensburg	684 Ulm *(0,2511)*	634 Konstanz *(0,1040)*	674 Schwäb. Hall *(0,0968)*	687 Vill.-Schwenn. *(0,0938)*	667 Rottweil *(0,0588)*	60,46
664 Reutlingen	671 Waiblingen *(0,1658)*	617 Freiburg *(0,1145)*	614 Balingen *(0,0861)*	641 Ludwigsburg *(0,0662)*	621 Göppingen *(0,0592)*	49,19
667 Rottweil	687 Vill.-Schwenn. *(0,2367)*	614 Balingen *(0,0940)*	651 Offenburg *(0,0809)*	611 Aalen *(0,0766)*	671 Waiblingen *(0,0718)*	56,00
671 Waiblingen	641 Ludwigsburg *(0,2522)*	621 Göppingen *(0,1956)*	611 Aalen *(0,1299)*	627 Heilbronn *(0,0637)*	664 Reutlingen *(0,0521)*	69,35
674 Schwäb. Hall	661 Ravensburg *(0,1536)*	759 Würzburg *(0,0944)*	684 Ulm *(0,0717)*	681 Tauberbischofsh. *(0,0687)*	687 Vill.-Schwenn. *(0,0658)*	45,42
677 Stuttgart	843 München *(0,2491)*	419 Frankfurt *(0,2424)*	621 Göppingen *(0,0994)*	624 Heidelberg *(0,0923)*	644 Mannheim *(0,0846)*	76,78
681 Tauberbischofsh.	715 Aschaffenburg *(0,1902)*	759 Würzburg *(0,1235)*	543 Landau *(0,0650)*	431 Hanau *(0,0572)*	647 Nagold *(0,0546)*	49,06
684 Ulm	661 Ravensburg *(0,1689)*	621 Göppingen *(0,1515)*	611 Aalen *(0,1032)*	641 Ludwigsburg *(0,0842)*	671 Waiblingen *(0,0622)*	57,00
687 Vill.-Schwenn.	637 Lörrach *(0,1928)*	667 Rottweil *(0,1901)*	651 Offenburg *(0,1162)*	617 Freiburg *(0,0917)*	661 Ravensburg *(0,0498)*	64,07
711 Ansbach	755 Weißenburg *(0,8585)*	743 Schwandorf *(0,0497)*	719 Bamberg *(0,0206)*	751 Weiden *(0,0161)*	851 Pfarrkirchen *(0,0124)*	95,73
715 Aschaffenburg	681 Tauberbischofsh. *(0,1543)*	431 Hanau *(0,1438)*	759 Würzburg *(0,1021)*	543 Landau *(0,0775)*	423 Fulda *(0,0379)*	51,55
719 Bamberg	747 Schweinfurt *(0,3098)*	723 Bayreuth *(0,1562)*	727 Coburg *(0,0854)*	759 Würzburg *(0,0572)*	751 Weiden *(0,0443)*	65,28
723 Bayreuth	751 Weiden *(0,4746)*	719 Bamberg *(0,1947)*	731 Hof *(0,1335)*	727 Coburg *(0,0565)*	755 Weißenburg *(0,0302)*	88,94
727 Coburg	731 Hof *(0,5104)*	719 Bamberg *(0,1257)*	723 Bayreuth *(0,0634)*	747 Schweinfurt *(0,0365)*	439 Korbach *(0,0260)*	76,19
731 Hof	727 Coburg *(0,6060)*	723 Bayreuth *(0,1816)*	751 Weiden *(0,0590)*	719 Bamberg *(0,0332)*	439 Korbach *(0,0152)*	89,50
735 Nürnberg	631 Karlsruhe *(0,1211)*	644 Mannheim *(0,1109)*	415 Darmstadt *(0,0556)*	451 Offenbach *(0,0501)*	627 Heilbronn *(0,0498)*	38,75
739 Regensburg	827 Ingolstadt *(0,3644)*	839 Memmingen *(0,1300)*	747 Schweinfurt *(0,0635)*	835 Landshut *(0,0622)*	823 Freising *(0,0611)*	68,11
743 Schwandorf	815 Deggendorf *(0,4523)*	755 Weißenburg *(0,1634)*	851 Pfarrkirchen *(0,1449)*	751 Weiden *(0,1213)*	711 Ansbach *(0,0602)*	94,20
747 Schweinfurt	719 Bamberg *(0,3750)*	423 Fulda *(0,0971)*	759 Würzburg *(0,0816)*	715 Aschaffenburg *(0,0489)*	839 Memmingen *(0,0436)*	64,62
751 Weiden	723 Bayreuth *(0,6241)*	755 Weißenburg *(0,0929)*	719 Bamberg *(0,0763)*	731 Hof *(0,0528)*	743 Schwandorf *(0,0525)*	89,87
755 Weißenburg	711 Ansbach *(0,5804)*	751 Weiden *(0,1078)*	743 Schwandorf *(0,0847)*	723 Bayreuth *(0,0482)*	719 Bamberg *(0,0440)*	86,51
759 Würzburg	681 Tauberbischofsh. *(0,1805)*	715 Aschaffenburg *(0,1747)*	674 Schwäb. Hall *(0,0645)*	747 Schweinfurt *(0,0636)*	719 Bamberg *(0,0618)*	54,51
811 Augsburg	611 Aalen *(0,1006)*	715 Aschaffenburg *(0,0650)*	543 Landau *(0,0624)*	654 Pforzheim *(0,0622)*	681 Tauberbischofsh. *(0,0569)*	34,70
815 Deggendorf	847 Passau *(0,5466)*	743 Schwandorf *(0,3910)*	859 Traunstein *(0,0404)*	851 Pfarrkirchen *(0,0136)*	711 Ansbach *(0,0043)*	99,59
819 Donauwörth	839 Memmingen *(0,4132)*	747 Schweinfurt *(0,0616)*	811 Augsburg *(0,0528)*	739 Regensburg *(0,0431)*	719 Bamberg *(0,0425)*	61,34
823 Freising	739 Regensburg *(0,4280)*	827 Ingolstadt *(0,2979)*	835 Landshut *(0,1965)*	839 Memmingen *(0,0177)*	863 Weilheim *(0,0162)*	95,62
827 Ingolstadt	739 Regensburg *(0,5910)*	835 Landshut *(0,1242)*	839 Memmingen *(0,1230)*	823 Freising *(0,0561)*	819 Donauwörth *(0,0485)*	94,28
831 Kempten	863 Weilheim *(0,3948)*	855 Rosenheim *(0,1978)*	839 Memmingen *(0,1634)*	739 Regensburg *(0,0334)*	719 Bamberg *(0,0317)*	82,12
835 Landshut	823 Freising *(0,3531)*	827 Ingolstadt *(0,3020)*	739 Regensburg *(0,2079)*	851 Pfarrkirchen *(0,1044)*	743 Schwandorf *(0,0104)*	97,76
839 Memmingen	819 Donauwörth *(0,2993)*	831 Kempten *(0,1288)*	739 Regensburg *(0,0990)*	747 Schweinfurt *(0,0777)*	827 Ingolstadt *(0,0550)*	65,97
843 München	677 Stuttgart *(0,3786)*	644 Mannheim *(0,1175)*	624 Heidelberg *(0,0911)*	735 Nürnberg *(0,0802)*	631 Karlsruhe *(0,0718)*	73,93
847 Passau	815 Deggendorf *(0,8275)*	859 Traunstein *(0,1420)*	743 Schwandorf *(0,0295)*	851 Pfarrkirchen *(0,0008)*	711 Ansbach *(0,0001)*	99,99
851 Pfarrkirchen	743 Schwandorf *(0,2919)*	755 Weißenburg *(0,1452)*	739 Regensburg *(0,1321)*	835 Landshut *(0,0920)*	839 Memmingen *(0,0599)*	72,11
855 Rosenheim	863 Weilheim *(0,6553)*	831 Kempten *(0,1892)*	719 Bamberg *(0,0227)*	839 Memmingen *(0,0207)*	739 Regensburg *(0,0206)*	90,85
859 Traunstein	847 Passau *(0,5832)*	815 Deggendorf *(0,2894)*	743 Schwandorf *(0,0810)*	851 Pfarrkirchen *(0,0357)*	755 Weißenburg *(0,0040)*	99,33
863 Weilheim	855 Rosenheim *(0,5708)*	831 Kempten *(0,3041)*	755 Weißenburg *(0,0387)*	719 Bamberg *(0,0144)*	839 Memmingen *(0,0134)*	94,14
900 Berlin	75 Leipzig *(0,3103)*	74 Dresden *(0,2608)*	333 Dortmund *(0,2171)*	345 Gelsenkirchen *(0,0366)*	39 Potsdam *(0,0219)*	84,67

Table 5. Estimated benchmark groups (average for 2007); 5 nearest neighbors and normalized weights in brackets

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
31 Neubrandenburg	48 Stendal *(0,2607)*	36 Eberswalde *(0,2432)*	32 Rostock *(0,0673)*	37 Frankfurt/Oder *(0,0653)*	72 Bautzen *(0,0641)*	70,06
32 Rostock	33 Schwerin *(0,5079)*	45 Magdeburg *(0,1226)*	43 Halberstadt *(0,0505)*	38 Neuruppin *(0,0445)*	37 Frankfurt/Oder *(0,0385)*	76,40
33 Schwerin	32 Rostock *(0,2605)*	45 Magdeburg *(0,2378)*	38 Neuruppin *(0,0816)*	37 Frankfurt/Oder *(0,0808)*	79 Riesa *(0,0427)*	70,34
34 Stralsund	31 Neubrandenburg *(0,9473)*	32 Rostock *(0,0452)*	37 Frankfurt/Oder *(0,0025)*	36 Eberswalde *(0,0021)*	33 Schwerin *(0,0014)*	99,86
35 Cottbus	72 Bautzen *(0,2823)*	46 Merseburg *(0,1475)*	37 Frankfurt/Oder *(0,1262)*	79 Riesa *(0,0849)*	42 Dessau *(0,0627)*	70,36
36 Eberswalde	38 Neuruppin *(0,2547)*	37 Frankfurt/Oder *(0,1245)*	72 Bautzen *(0,1070)*	48 Stendal *(0,0994)*	76 Oschatz *(0,0773)*	66,28
37 Frankfurt/Oder	38 Neuruppin *(0,1364)*	35 Cottbus *(0,1335)*	79 Riesa *(0,1042)*	36 Eberswalde *(0,0768)*	49 Wittenberg *(0,0672)*	51,80
38 Neuruppin	48 Stendal *(0,2184)*	36 Eberswalde *(0,1409)*	37 Frankfurt/Oder *(0,1303)*	49 Wittenberg *(0,0834)*	42 Dessau *(0,0712)*	64,41
39 Potsdam	45 Magdeburg *(0,2792)*	96 Jena *(0,1164)*	44 Halle *(0,1003)*	93 Erfurt *(0,0941)*	271 Uelzen *(0,0413)*	63,14
42 Dessau	49 Wittenberg *(0,2125)*	44 Halle *(0,1457)*	45 Magdeburg *(0,0986)*	46 Merseburg *(0,0862)*	43 Halberstadt *(0,0837)*	62,67
43 Halberstadt	45 Magdeburg *(0,1056)*	42 Dessau *(0,0950)*	94 Gera *(0,0868)*	95 Gotha *(0,0799)*	97 Nordhausen *(0,0731)*	44,03
44 Halle	75 Leipzig *(0,3990)*	93 Erfurt *(0,2075)*	42 Dessau *(0,1258)*	73 Chemnitz *(0,0943)*	45 Magdeburg *(0,0506)*	87,72
45 Magdeburg	96 Jena *(0,1251)*	33 Schwerin *(0,1104)*	42 Dessau *(0,1077)*	43 Halberstadt *(0,1011)*	93 Erfurt *(0,0969)*	54,11
46 Merseburg	42 Dessau *(0,1230)*	35 Cottbus *(0,1226)*	70 Altenburg *(0,1011)*	47 Sangerhausen *(0,0983)*	49 Wittenberg *(0,0724)*	51,74
47 Sangerhausen	70 Altenburg *(0,2291)*	46 Merseburg *(0,1659)*	48 Stendal *(0,1150)*	76 Oschatz *(0,1011)*	72 Bautzen *(0,0802)*	69,13
48 Stendal	38 Neuruppin *(0,3054)*	47 Sangerhausen *(0,1169)*	76 Oschatz *(0,1029)*	36 Eberswalde *(0,0804)*	43 Halberstadt *(0,0568)*	66,24
49 Wittenberg	42 Dessau *(0,2988)*	76 Oschatz *(0,1419)*	43 Halberstadt *(0,0720)*	79 Riesa *(0,0649)*	46 Merseburg *(0,0638)*	64,14
70 Altenburg	76 Oschatz *(0,1705)*	47 Sangerhausen *(0,1540)*	46 Merseburg *(0,1460)*	72 Bautzen *(0,1079)*	35 Cottbus *(0,0753)*	65,37
71 Annaberg-B.	76 Oschatz *(0,4028)*	70 Altenburg *(0,1718)*	78 Plauen *(0,1178)*	97 Nordhausen *(0,0876)*	77 Pirna *(0,0622)*	84,22
72 Bautzen	35 Cottbus *(0,2630)*	76 Cottbus *(0,1842)*	70 Altenburg *(0,1002)*	79 Riesa *(0,0625)*	36 Eberswalde *(0,0600)*	66,98
73 Chemnitz	92 Zwickau *(0,5738)*	44 Halle *(0,1216)*	93 Erfurt *(0,1169)*	75 Leipzig *(0,0624)*	96 Jena *(0,0311)*	90,58
74 Dresden	39 Potsdam *(0,3072)*	75 Leipzig *(0,2600)*	900 Berlin *(0,1197)*	73 Chemnitz *(0,0767)*	44 Halle *(0,0571)*	82,06
75 Leipzig	44 Halle *(0,6743)*	93 Erfurt *(0,1586)*	73 Chemnitz *(0,0784)*	92 Zwickau *(0,0133)*	39 Potsdam *(0,0119)*	93,64
76 Oschatz	97 Nordhausen *(0,1421)*	72 Bautzen *(0,1382)*	49 Wittenberg *(0,1283)*	70 Altenburg *(0,1175)*	79 Riesa *(0,0796)*	60,57
77 Pirna	79 Riesa *(0,2586)*	78 Plauen *(0,1823)*	94 Gera *(0,1777)*	76 Oschatz *(0,0912)*	72 Bautzen *(0,0533)*	76,30
78 Plauen	94 Gera *(0,6196)*	98 Suhl *(0,0770)*	95 Gotha *(0,0477)*	79 Riesa *(0,0428)*	96 Jena *(0,0399)*	82,70
79 Riesa	94 Gera *(0,0932)*	76 Oschatz *(0,0814)*	78 Plauen *(0,0799)*	37 Frankfurt/Oder *(0,0662)*	49 Wittenberg *(0,0625)*	38,32
92 Zwickau	73 Chemnitz *(0,6558)*	93 Erfurt *(0,0544)*	44 Halle *(0,0390)*	78 Plauen *(0,0371)*	70 Altenburg *(0,0343)*	82,06
93 Erfurt	96 Jena *(0,2544)*	44 Halle *(0,2335)*	75 Leipzig *(0,1071)*	73 Chemnitz *(0,0992)*	45 Magdeburg *(0,0761)*	77,04
94 Gera	78 Plauen *(0,5462)*	96 Jena *(0,0934)*	98 Suhl *(0,0928)*	95 Gotha *(0,0716)*	79 Riesa *(0,0436)*	84,75
95 Gotha	98 Suhl *(0,3408)*	96 Jena *(0,1784)*	94 Gera *(0,1356)*	78 Plauen *(0,0799)*	43 Halberstadt *(0,0747)*	80,94
96 Jena	93 Erfurt *(0,2730)*	95 Gotha *(0,1613)*	94 Gera *(0,1525)*	45 Magdeburg *(0,1027)*	98 Suhl *(0,0639)*	75,34
97 Nordhausen	76 Oschatz *(0,3357)*	43 Halberstadt *(0,1815)*	47 Sangerhausen *(0,1118)*	48 Stendal *(0,0485)*	70 Altenburg *(0,0417)*	71,92
98 Suhl	95 Gotha *(0,4338)*	94 Gera *(0,2267)*	78 Plauen *(0,1712)*	96 Jena *(0,0882)*	43 Halberstadt *(0,0217)*	94,16
111 Bad Oldesloe	115 Elmshorn *(0,2420)*	139 Neumünster *(0,1629)*	277 Verden *(0,0825)*	251 Lüneburg *(0,0797)*	264 Osnabrück *(0,0519)*	61,90
115 Elmshorn	111 Bad Oldesloe *(0,2009)*	139 Neumünster *(0,1055)*	261 Oldenburg *(0,0928)*	277 Verden *(0,0471)*	264 Osnabrück *(0,0469)*	49,32
119 Flensburg	127 Heide *(0,2213)*	135 Lübeck *(0,2028)*	281 Wilhelmshaven *(0,1345)*	271 Uelzen *(0,1096)*	139 Neumünster *(0,0699)*	73,81
123 Hamburg	214 Bremen *(0,7065)*	337 Düsseldorf *(0,1916)*	419 Frankfurt *(0,0311)*	237 Hannover *(0,0295)*	357 Köln *(0,0169)*	97,56
127 Heide	224 Emden *(0,4572)*	119 Flensburg *(0,3757)*	267 Stade *(0,0783)*	281 Wilhelmshaven *(0,0208)*	271 Uelzen *(0,0168)*	94,89
131 Kiel	135 Lübeck *(0,1249)*	115 Elmshorn *(0,0895)*	261 Oldenburg *(0,0752)*	139 Neumünster *(0,0722)*	244 Hildesheim *(0,0525)*	41,43
135 Lübeck	119 Flensburg *(0,1882)*	131 Kiel *(0,1639)*	281 Wilhelmshaven *(0,1247)*	271 Uelzen *(0,1064)*	139 Neumünster *(0,0671)*	65,03
139 Neumünster	251 Lüneburg *(0,1610)*	277 Verden *(0,1320)*	111 Bad Oldesloe *(0,1083)*	221 Celle *(0,0887)*	115 Elmshorn *(0,0846)*	57,45
211 Braunschweig	237 Hannover *(0,1689)*	244 Hildesheim *(0,0957)*	241 Helmstedt *(0,0789)*	231 Göttingen *(0,0502)*	383 Soest *(0,0494)*	44,31
214 Bremen	237 Hannover *(0,3664)*	435 Kassel *(0,0871)*	123 Hamburg *(0,0779)*	211 Braunschweig *(0,0554)*	317 Bielefeld *(0,0507)*	63,75

(continued)

Table 5. Estimated benchmark groups (average for 2007); 5 nearest neighbors and normalized weights in brackets (continued)

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
217 Bremerhaven	267 Stade *(0,3052)*	281 Wilhelmshaven *(0,2702)*	261 Oldenburg *(0,1431)*	375 Recklinghausen *(0,0373)*	131 Kiel *(0,0362)*	79,20
221 Celle	254 Nienburg *(0,1434)*	244 Hildesheim *(0,1177)*	277 Verden *(0,0853)*	251 Lüneburg *(0,0702)*	261 Oldenburg *(0,0632)*	47,96
224 Emden	127 Heide *(0,9463)*	119 Flensburg *(0,0229)*	247 Leer *(0,0138)*	281 Wilhelmshaven *(0,0047)*	267 Stade *(0,0017)*	98,94
227 Goslar	231 Göttingen *(0,3497)*	234 Hameln *(0,1950)*	244 Hildesheim *(0,1527)*	221 Celle *(0,0413)*	271 Uelzen *(0,0242)*	76,29
231 Göttingen	227 Goslar *(0,2043)*	244 Hildesheim *(0,1887)*	234 Hameln *(0,1278)*	331 Detmold *(0,0753)*	351 Hamm *(0,0451)*	64,12
234 Hameln	244 Hildesheim *(0,3099)*	331 Detmold *(0,1301)*	231 Göttingen *(0,1092)*	227 Goslar *(0,1011)*	221 Celle *(0,0742)*	72,46
237 Hannover	211 Braunschweig *(0,3311)*	214 Bremen *(0,2010)*	357 Köln *(0,0458)*	333 Dortmund *(0,0407)*	435 Kassel *(0,0328)*	65,15
241 Helmstedt	211 Braunschweig *(0,7170)*	355 Iserlohn *(0,0311)*	317 Bielefeld *(0,0288)*	381 Siegen *(0,0273)*	415 Darmstadt *(0,0270)*	83,12
244 Hildesheim	234 Hameln *(0,2044)*	231 Göttingen *(0,1042)*	221 Celle *(0,1005)*	331 Detmold *(0,0932)*	227 Goslar *(0,0498)*	55,21
247 Leer	274 Vechta *(0,6949)*	257 Nordhorn *(0,0779)*	254 Nienburg *(0,0550)*	411 Bad Hersfeld *(0,0371)*	327 Coesfeld *(0,0286)*	89,36
251 Lüneburg	139 Neumünster *(0,2467)*	221 Celle *(0,1761)*	277 Verden *(0,1062)*	111 Bad Oldesloe *(0,0819)*	271 Uelzen *(0,0749)*	68,58
254 Nienburg	221 Celle *(0,2230)*	277 Verden *(0,2167)*	261 Oldenburg *(0,0482)*	139 Neumünster *(0,0395)*	411 Bad Hersfeld *(0,0353)*	56,27
257 Nordhorn	327 Coesfeld *(0,4198)*	377 Rheine *(0,1994)*	274 Vechta *(0,1066)*	264 Osnabrück *(0,0308)*	411 Bad Hersfeld *(0,0222)*	77,87
261 Oldenburg	281 Wilhelmshaven *(0,1843)*	221 Celle *(0,0745)*	277 Verden *(0,0710)*	264 Osnabrück *(0,0623)*	139 Neumünster *(0,0583)*	45,04
264 Osnabrück	353 Herford *(0,2087)*	377 Rheine *(0,1618)*	373 Paderborn *(0,0621)*	313 Ahlen *(0,0545)*	331 Detmold *(0,0488)*	53,59
267 Stade	221 Celle *(0,1473)*	139 Neumünster *(0,1435)*	261 Oldenburg *(0,1178)*	115 Elmshorn *(0,0942)*	277 Verden *(0,0822)*	58,50
271 Uelzen	251 Lüneburg *(0,1715)*	221 Celle *(0,1449)*	135 Lübeck *(0,0975)*	119 Flensburg *(0,0955)*	254 Nienburg *(0,0652)*	57,45
274 Vechta	247 Leer *(0,4441)*	257 Nordhorn *(0,3877)*	327 Coesfeld *(0,0266)*	563 Trier *(0,0259)*	254 Nienburg *(0,0193)*	90,37
277 Verden	254 Nienburg *(0,2015)*	221 Celle *(0,1211)*	139 Neumünster *(0,1133)*	261 Oldenburg *(0,0834)*	251 Lüneburg *(0,0600)*	57,92
281 Wilhelmshaven	261 Oldenburg *(0,4334)*	221 Celle *(0,0678)*	119 Flensburg *(0,0627)*	135 Lübeck *(0,0601)*	254 Nienburg *(0,0368)*	66,07
311 Aachen	361 Krefeld *(0,1532)*	335 Düren *(0,1249)*	321 Bochum *(0,0811)*	385 Solingen *(0,0750)*	347 Hagen *(0,0509)*	48,50
313 Ahlen	383 Soest *(0,1427)*	363 Meschede *(0,1082)*	373 Paderborn *(0,1009)*	317 Bielefeld *(0,0936)*	377 Rheine *(0,0795)*	52,50
315 Bergisch Gladb.	385 Solingen *(0,1887)*	365 Mönchengladb. *(0,1826)*	347 Hagen *(0,1792)*	391 Wuppertal *(0,1029)*	361 Krefeld *(0,0660)*	71,94
317 Bielefeld	373 Paderborn *(0,1584)*	313 Ahlen *(0,1089)*	383 Soest *(0,1039)*	353 Herford *(0,0932)*	331 Detmold *(0,0772)*	54,16
321 Bochum	347 Hagen *(0,1828)*	391 Wuppertal *(0,1598)*	333 Dortmund *(0,0947)*	343 Essen *(0,0816)*	345 Gelsenkirchen *(0,0799)*	59,87
323 Bonn	527 Mainz *(0,2100)*	459 Wiesbaden *(0,1920)*	415 Darmstadt *(0,0552)*	367 Münster *(0,0542)*	385 Solingen *(0,0337)*	54,51
325 Brühl	335 Düren *(0,6118)*	365 Mönchengladb. *(0,1541)*	315 Bergisch Gladb. *(0,0886)*	387 Wesel *(0,0218)*	361 Krefeld *(0,0183)*	89,45
327 Coesfeld	377 Rheine *(0,3172)*	257 Nordhorn *(0,1701)*	313 Ahlen *(0,1015)*	547 Neuwied *(0,0542)*	264 Osnabrück *(0,0490)*	69,20
331 Detmold	373 Paderborn *(0,2259)*	353 Herford *(0,2039)*	244 Hildesheim *(0,0575)*	234 Hameln *(0,0477)*	383 Soest *(0,0429)*	57,79
333 Dortmund	321 Bochum *(0,2136)*	371 Oberhausen *(0,1465)*	341 Duisburg *(0,1229)*	345 Gelsenkirchen *(0,1228)*	343 Essen *(0,1203)*	72,61
335 Düren	325 Brühl *(0,3038)*	365 Mönchengladb. *(0,1120)*	311 Aachen *(0,1047)*	385 Solingen *(0,0874)*	315 Bergisch Gladb. *(0,0740)*	68,19
337 Düsseldorf	357 Köln *(0,6948)*	419 Frankfurt *(0,1759)*	343 Essen *(0,0284)*	123 Hamburg *(0,0127)*	237 Hannover *(0,0119)*	92,37
341 Duisburg	371 Oberhausen *(0,3681)*	333 Dortmund *(0,2019)*	321 Bochum *(0,1090)*	343 Essen *(0,0893)*	345 Gelsenkirchen *(0,0796)*	84,78
343 Essen	321 Bochum *(0,2591)*	333 Dortmund *(0,1950)*	371 Oberhausen *(0,1653)*	391 Wuppertal *(0,1327)*	341 Duisburg *(0,0850)*	83,71
345 Gelsenkirchen	375 Recklinghausen *(0,3458)*	371 Oberhausen *(0,3026)*	321 Bochum *(0,1278)*	333 Dortmund *(0,0887)*	341 Duisburg *(0,0377)*	90,26
347 Hagen	391 Wuppertal *(0,2104)*	385 Solingen *(0,2083)*	321 Bochum *(0,0994)*	361 Krefeld *(0,0928)*	365 Mönchengladb. *(0,0633)*	67,41
351 Hamm	375 Recklinghausen *(0,2298)*	347 Hagen *(0,1379)*	383 Soest *(0,0982)*	331 Detmold *(0,0402)*	361 Krefeld *(0,0372)*	54,34
353 Herford	331 Detmold *(0,2367)*	264 Osnabrück *(0,1687)*	373 Paderborn *(0,0992)*	383 Soest *(0,0655)*	317 Bielefeld *(0,0480)*	61,82
355 Iserlohn	381 Siegen *(0,2055)*	347 Hagen *(0,1315)*	385 Solingen *(0,1155)*	383 Soest *(0,0880)*	363 Meschede *(0,0482)*	58,87
357 Köln	337 Düsseldorf *(0,6055)*	343 Essen *(0,0891)*	237 Hannover *(0,0654)*	391 Wuppertal *(0,0400)*	323 Bonn *(0,0222)*	82,22
361 Krefeld	365 Mönchengladb. *(0,2736)*	347 Hagen *(0,1562)*	385 Solingen *(0,1194)*	391 Wuppertal *(0,0473)*	311 Aachen *(0,0412)*	63,76
363 Meschede	373 Paderborn *(0,1052)*	383 Soest *(0,1008)*	439 Korbach *(0,0910)*	313 Ahlen *(0,0877)*	381 Siegen *(0,0602)*	44,49
365 Mönchengladb.	361 Krefeld *(0,3015)*	391 Wuppertal *(0,1726)*	347 Hagen *(0,1182)*	315 Bergisch Gladb. *(0,1159)*	385 Solingen *(0,0745)*	78,27
367 Münster	323 Bonn *(0,4494)*	317 Bielefeld *(0,2142)*	459 Wiesbaden *(0,0727)*	237 Hannover *(0,0459)*	624 Heidelberg *(0,0265)*	80,87

(continued)

Table 5. Estimated benchmark groups (average for 2007); 5 nearest neighbors and normalized weights in brackets (continued)

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
371 Oberhausen	345 Gelsenkirchen *(0,2874)*	341 Duisburg *(0,1578)*	333 Dortmund *(0,1026)*	321 Bochum *(0,0894)*	375 Recklinghausen *(0,0770)*	71,42
373 Paderborn	331 Detmold *(0,2588)*	353 Herford *(0,0969)*	317 Bielefeld *(0,0803)*	363 Meschede *(0,0758)*	383 Soest *(0,0673)*	57,92
375 Recklinghausen	345 Gelsenkirchen *(0,3085)*	351 Hamm *(0,2340)*	371 Oberhausen *(0,0722)*	321 Bochum *(0,0600)*	387 Wesel *(0,0495)*	72,41
377 Rheine	327 Coesfeld *(0,2655)*	264 Osnabrück *(0,2552)*	313 Ahlen *(0,0993)*	257 Nordhorn *(0,0704)*	373 Paderborn *(0,0407)*	73,11
381 Siegen	355 Iserlohn *(0,2831)*	455 Wetzlar *(0,1804)*	363 Meschede *(0,1215)*	547 Neuwied *(0,0491)*	313 Ahlen *(0,0395)*	67,36
383 Soest	313 Ahlen *(0,1007)*	363 Meschede *(0,0851)*	373 Paderborn *(0,0771)*	353 Herford *(0,0742)*	351 Hamm *(0,0710)*	40,82
385 Solingen	347 Hagen *(0,2659)*	391 Wuppertal *(0,2038)*	361 Krefeld *(0,0869)*	315 Bergisch Gladb. *(0,0795)*	321 Bochum *(0,0590)*	69,51
387 Wesel	375 Recklinghausen *(0,1210)*	361 Krefeld *(0,1177)*	351 Hamm *(0,0759)*	244 Hildesheim *(0,0480)*	347 Hagen *(0,0404)*	40,29
391 Wuppertal	347 Hagen *(0,2939)*	385 Solingen *(0,2256)*	365 Mönchengladb. *(0,1321)*	321 Bochum *(0,1191)*	315 Bergisch Gladb. *(0,0497)*	82,03
411 Bad Hersfeld	423 Fulda *(0,3018)*	439 Korbach *(0,0994)*	254 Nienburg *(0,0597)*	511 Bad Kreuznach *(0,0414)*	443 Limburg *(0,0405)*	54,29
415 Darmstadt	451 Offenbach *(0,1978)*	644 Mannheim *(0,1416)*	527 Mainz *(0,1302)*	523 Ludwigshafen *(0,0551)*	624 Heidelberg *(0,0354)*	56,01
419 Frankfurt	337 Düsseldorf *(0,6050)*	677 Stuttgart *(0,2202)*	843 München *(0,0402)*	644 Mannheim *(0,0397)*	459 Wiesbaden *(0,0370)*	94,21
423 Fulda	411 Bad Hersfeld *(0,2040)*	747 Schweinfurt *(0,1171)*	431 Hanau *(0,0985)*	439 Korbach *(0,0746)*	759 Würzburg *(0,0699)*	56,41
427 Gießen	431 Hanau *(0,1293)*	443 Limburg *(0,1249)*	331 Detmold *(0,0527)*	373 Paderborn *(0,0464)*	515 Kaiserslautern *(0,0420)*	39,52
431 Hanau	427 Gießen *(0,0856)*	715 Aschaffenburg *(0,0719)*	543 Landau *(0,0710)*	423 Fulda *(0,0459)*	547 Neuwied *(0,0440)*	31,84
435 Kassel	317 Bielefeld *(0,1326)*	373 Paderborn *(0,1167)*	383 Soest *(0,0713)*	231 Göttingen *(0,0603)*	211 Braunschweig *(0,0582)*	43,91
439 Korbach	363 Meschede *(0,2341)*	423 Fulda *(0,0856)*	411 Bad Hersfeld *(0,0838)*	373 Paderborn *(0,0387)*	511 Bad Kreuznach *(0,0324)*	47,47
443 Limburg	511 Bad Kreuznach *(0,1514)*	547 Neuwied *(0,1348)*	427 Gießen *(0,1222)*	535 Montabaur *(0,1022)*	431 Hanau *(0,0535)*	56,42
447 Marburg	427 Gießen *(0,2155)*	439 Korbach *(0,1644)*	373 Paderborn *(0,0653)*	759 Würzburg *(0,0548)*	519 Koblenz *(0,0419)*	54,19
451 Offenbach	415 Darmstadt *(0,3313)*	644 Mannheim *(0,0599)*	361 Krefeld *(0,0457)*	527 Mainz *(0,0446)*	431 Hanau *(0,0401)*	52,16
455 Wetzlar	381 Siegen *(0,2571)*	355 Iserlohn *(0,0947)*	317 Bielefeld *(0,0809)*	547 Neuwied *(0,0510)*	373 Paderborn *(0,0462)*	52,99
459 Wiesbaden	527 Mainz *(0,4150)*	323 Bonn *(0,1613)*	415 Darmstadt *(0,0977)*	644 Mannheim *(0,0671)*	451 Offenbach *(0,0490)*	79,01
511 Bad Kreuznach	515 Kaiserslautern *(0,2429)*	547 Neuwied *(0,1022)*	443 Limburg *(0,0970)*	551 Pirmasens *(0,0701)*	519 Koblenz *(0,0625)*	57,47
515 Kaiserslautern	511 Bad Kreuznach *(0,2338)*	551 Pirmasens *(0,1489)*	539 Neunkirchen *(0,1258)*	543 Landau *(0,1075)*	547 Neuwied *(0,0421)*	65,82
519 Koblenz	511 Bad Kreuznach *(0,1911)*	515 Kaiserslautern *(0,0760)*	531 Mayen *(0,0744)*	547 Neuwied *(0,0610)*	527 Mainz *(0,0359)*	43,84
523 Ludwigshafen	644 Mannheim *(0,2363)*	415 Darmstadt *(0,1643)*	631 Karlsruhe *(0,1293)*	527 Mainz *(0,0675)*	315 Bergisch Gladb. *(0,0417)*	63,91
527 Mainz	459 Wiesbaden *(0,1858)*	415 Darmstadt *(0,1664)*	323 Bonn *(0,0765)*	631 Karlsruhe *(0,0412)*	451 Offenbach *(0,0340)*	50,39
531 Mayen	563 Trier *(0,2493)*	535 Montabaur *(0,0988)*	519 Koblenz *(0,0974)*	511 Bad Kreuznach *(0,0907)*	547 Neuwied *(0,0657)*	60,19
535 Montabaur	547 Neuwied *(0,3128)*	443 Limburg *(0,2580)*	511 Bad Kreuznach *(0,1057)*	531 Mayen *(0,0991)*	327 Coesfeld *(0,0363)*	81,18
539 Neunkirchen	559 Saarlouis *(0,2278)*	515 Kaiserslautern *(0,1457)*	543 Landau *(0,0894)*	511 Bad Kreuznach *(0,0642)*	555 Saarbrücken *(0,0514)*	57,85
543 Landau	515 Kaiserslautern *(0,1271)*	539 Neunkirchen *(0,0908)*	647 Nagold *(0,0759)*	431 Hanau *(0,0744)*	551 Pirmasens *(0,0620)*	43,02
547 Neuwied	511 Bad Kreuznach *(0,1189)*	443 Limburg *(0,0991)*	535 Montabaur *(0,0765)*	363 Meschede *(0,0616)*	515 Kaiserslautern *(0,0514)*	40,74
551 Pirmasens	515 Kaiserslautern *(0,3225)*	511 Bad Kreuznach *(0,1493)*	543 Landau *(0,1109)*	539 Neunkirchen *(0,0465)*	443 Limburg *(0,0455)*	67,47
555 Saarbrücken	539 Neunkirchen *(0,1578)*	559 Saarlouis *(0,0857)*	347 Hagen *(0,0601)*	385 Solingen *(0,0423)*	451 Offenbach *(0,0418)*	38,76
559 Saarlouis	539 Neunkirchen *(0,3512)*	543 Landau *(0,0686)*	515 Kaiserslautern *(0,0447)*	555 Saarbrücken *(0,0435)*	547 Neuwied *(0,0419)*	54,99
563 Trier	531 Mayen *(0,4535)*	747 Schweinfurt *(0,0621)*	519 Koblenz *(0,0564)*	831 Kempten *(0,0450)*	759 Würzburg *(0,0372)*	65,42
611 Aalen	671 Waiblingen *(0,2169)*	641 Ludwigsburg *(0,1057)*	621 Göppingen *(0,0794)*	657 Rastatt *(0,0785)*	654 Pforzheim *(0,0672)*	54,78
614 Balingen	651 Offenburg *(0,1782)*	647 Nagold *(0,1203)*	654 Pforzheim *(0,0739)*	634 Konstanz *(0,0709)*	664 Reutlingen *(0,0652)*	50,84
617 Freiburg	637 Lörrach *(0,3223)*	664 Reutlingen *(0,1763)*	651 Offenburg *(0,0928)*	687 Vill.-Schwenn. *(0,0758)*	527 Mainz *(0,0445)*	71,16
621 Göppingen	671 Waiblingen *(0,2650)*	627 Heilbronn *(0,1676)*	684 Ulm *(0,1645)*	641 Ludwigsburg *(0,1402)*	611 Aalen *(0,0617)*	79,90
624 Heidelberg	644 Mannheim *(0,2608)*	631 Karlsruhe *(0,1978)*	415 Darmstadt *(0,0985)*	641 Ludwigsburg *(0,0723)*	527 Mainz *(0,0615)*	69,08
627 Heilbronn	621 Göppingen *(0,2316)*	671 Waiblingen *(0,2073)*	641 Ludwigsburg *(0,1709)*	644 Mannheim *(0,1027)*	684 Ulm *(0,0504)*	76,28
631 Karlsruhe	641 Ludwigsburg *(0,1708)*	644 Mannheim *(0,1491)*	657 Rastatt *(0,1041)*	624 Heidelberg *(0,0932)*	654 Pforzheim *(0,0804)*	59,76
634 Konstanz	614 Balingen *(0,1973)*	647 Nagold *(0,1039)*	687 Vill.-Schwenn. *(0,0983)*	664 Reutlingen *(0,0884)*	661 Ravensburg *(0,0602)*	54,82

(continued)

Table 5. Estimated benchmark groups (average for 2007); 5 nearest neighbors and normalized weights in brackets (continued)

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
637 Lörrach	617 Freiburg *(0,2791)*	687 Vill.-Schwenn. *(0,2100)*	651 Offenburg *(0,1306)*	654 Pforzheim *(0,0508)*	667 Rottweil *(0,0447)*	71,52
641 Ludwigsburg	671 Waiblingen *(0,3183)*	631 Karlsruhe *(0,1000)*	657 Rastatt *(0,0979)*	621 Göppingen *(0,0903)*	627 Heilbronn *(0,0876)*	69,41
644 Mannheim	415 Darmstadt *(0,1703)*	631 Karlsruhe *(0,1439)*	624 Heidelberg *(0,1197)*	523 Ludwigshafen *(0,1032)*	627 Heilbronn *(0,0893)*	62,64
647 Nagold	651 Offenburg *(0,1717)*	543 Landau *(0,1483)*	654 Pforzheim *(0,1329)*	614 Balingen *(0,1169)*	681 Tauberbischofsh. *(0,0561)*	62,59
651 Offenburg	654 Pforzheim *(0,1322)*	614 Balingen *(0,1145)*	647 Nagold *(0,1143)*	687 Vill.-Schwenn. *(0,0791)*	667 Rottweil *(0,0579)*	49,79
654 Pforzheim	651 Offenburg *(0,0890)*	671 Waiblingen *(0,0731)*	657 Rastatt *(0,0690)*	641 Ludwigsburg *(0,0621)*	647 Nagold *(0,0600)*	35,31
657 Rastatt	641 Ludwigsburg *(0,1770)*	631 Karlsruhe *(0,1100)*	654 Pforzheim *(0,0996)*	671 Waiblingen *(0,0938)*	611 Aalen *(0,0763)*	55,66
661 Ravensburg	667 Rottweil *(0,2231)*	684 Ulm *(0,2185)*	687 Vill.-Schwenn. *(0,1418)*	621 Göppingen *(0,0824)*	674 Schwäb. Hall *(0,0800)*	74,58
664 Reutlingen	671 Waiblingen *(0,1320)*	654 Pforzheim *(0,1239)*	617 Freiburg *(0,0985)*	641 Ludwigsburg *(0,0844)*	614 Balingen *(0,0664)*	50,52
667 Rottweil	687 Vill.-Schwenn. *(0,4165)*	661 Ravensburg *(0,0992)*	611 Aalen *(0,0651)*	651 Offenburg *(0,0594)*	657 Rastatt *(0,0586)*	69,87
671 Waiblingen	641 Ludwigsburg *(0,2963)*	621 Göppingen *(0,1583)*	611 Aalen *(0,1081)*	627 Heilbronn *(0,0922)*	654 Pforzheim *(0,0541)*	70,90
674 Schwäb. Hall	661 Ravensburg *(0,3024)*	684 Ulm *(0,2173)*	687 Vill.-Schwenn. *(0,1138)*	667 Rottweil *(0,0866)*	839 Memmingen *(0,0566)*	77,67
677 Stuttgart	843 München *(0,4023)*	419 Frankfurt *(0,1355)*	644 Mannheim *(0,1032)*	641 Ludwigsburg *(0,1024)*	621 Göppingen *(0,0980)*	84,14
681 Tauberbischofsh.	759 Würzburg *(0,1869)*	715 Aschaffenburg *(0,1200)*	654 Pforzheim *(0,0810)*	431 Hanau *(0,0629)*	651 Offenburg *(0,0535)*	50,43
684 Ulm	621 Göppingen *(0,3069)*	661 Ravensburg *(0,1771)*	627 Heilbronn *(0,0918)*	611 Aalen *(0,0676)*	687 Vill.-Schwenn. *(0,0649)*	70,83
687 Vill.-Schwenn.	667 Rottweil *(0,4759)*	637 Lörrach *(0,0991)*	651 Offenburg *(0,0882)*	661 Ravensburg *(0,0696)*	684 Ulm *(0,0400)*	77,28
711 Ansbach	755 Weißenburg *(0,8479)*	743 Schwandorf *(0,0343)*	719 Bamberg *(0,0320)*	855 Rosenheim *(0,0203)*	851 Pfarrkirchen *(0,0176)*	95,21
715 Aschaffenburg	759 Würzburg *(0,2042)*	747 Schweinfurt *(0,1504)*	681 Tauberbischofsh. *(0,1146)*	431 Hanau *(0,1078)*	423 Fulda *(0,0490)*	62,60
719 Bamberg	723 Bayreuth *(0,2424)*	747 Schweinfurt *(0,1675)*	751 Weiden *(0,1053)*	755 Weißenburg *(0,0865)*	759 Würzburg *(0,0618)*	66,36
723 Bayreuth	751 Weiden *(0,3099)*	719 Bamberg *(0,2846)*	731 Hof *(0,2536)*	727 Coburg *(0,0414)*	755 Weißenburg *(0,0166)*	90,61
727 Coburg	731 Hof *(0,4395)*	719 Bamberg *(0,0795)*	723 Bayreuth *(0,0464)*	751 Weiden *(0,0373)*	439 Korbach *(0,0356)*	63,82
731 Hof	727 Coburg *(0,4067)*	723 Bayreuth *(0,2609)*	751 Weiden *(0,1714)*	719 Bamberg *(0,0402)*	439 Korbach *(0,0211)*	90,04
735 Nürnberg	415 Darmstadt *(0,1161)*	631 Karlsruhe *(0,1006)*	451 Offenbach *(0,0714)*	811 Augsburg *(0,0702)*	611 Aalen *(0,0514)*	40,97
739 Regensburg	827 Ingolstadt *(0,3940)*	839 Memmingen *(0,1641)*	835 Landshut *(0,0798)*	819 Donauwörth *(0,0536)*	747 Schweinfurt *(0,0488)*	74,02
743 Schwandorf	815 Deggendorf *(0,2302)*	851 Pfarrkirchen *(0,1857)*	751 Weiden *(0,1718)*	711 Ansbach *(0,1077)*	739 Regensburg *(0,0780)*	77,35
747 Schweinfurt	715 Aschaffenburg *(0,1999)*	759 Würzburg *(0,1950)*	719 Bamberg *(0,1552)*	423 Fulda *(0,1142)*	681 Tauberbischofsh. *(0,0438)*	70,81
751 Weiden	723 Bayreuth *(0,3695)*	731 Hof *(0,1985)*	719 Bamberg *(0,1603)*	755 Weißenburg *(0,0884)*	727 Coburg *(0,0391)*	85,57
755 Weißenburg	711 Ansbach *(0,4676)*	719 Bamberg *(0,1969)*	751 Weiden *(0,1167)*	723 Bayreuth *(0,0298)*	855 Rosenheim *(0,0297)*	84,07
759 Würzburg	715 Aschaffenburg *(0,2021)*	681 Tauberbischofsh. *(0,1839)*	747 Schweinfurt *(0,1418)*	431 Hanau *(0,0552)*	423 Fulda *(0,0480)*	63,09
811 Augsburg	611 Aalen *(0,0873)*	654 Pforzheim *(0,0829)*	543 Landau *(0,0757)*	681 Tauberbischofsh. *(0,0536)*	431 Hanau *(0,0502)*	34,97
815 Deggendorf	847 Passau *(0,8260)*	859 Traunstein *(0,0847)*	743 Schwandorf *(0,0790)*	851 Pfarrkirchen *(0,0057)*	711 Ansbach *(0,0038)*	99,92
819 Donauwörth	839 Memmingen *(0,1207)*	715 Aschaffenburg *(0,1049)*	759 Würzburg *(0,1047)*	719 Bamberg *(0,0860)*	614 Balingen *(0,0854)*	50,17
823 Freising	827 Ingolstadt *(0,5619)*	739 Regensburg *(0,2862)*	839 Memmingen *(0,0718)*	674 Schwäb. Hall *(0,0302)*	835 Landshut *(0,0248)*	97,49
827 Ingolstadt	739 Regensburg *(0,5880)*	835 Landshut *(0,1713)*	839 Memmingen *(0,1670)*	823 Freising *(0,0433)*	819 Donauwörth *(0,0169)*	98,65
831 Kempten	863 Weilheim *(0,2572)*	855 Rosenheim *(0,1860)*	839 Memmingen *(0,1029)*	759 Würzburg *(0,0540)*	719 Bamberg *(0,0429)*	64,30
835 Landshut	827 Ingolstadt *(0,4223)*	739 Regensburg *(0,2938)*	851 Pfarrkirchen *(0,2405)*	839 Memmingen *(0,0108)*	743 Schwandorf *(0,0096)*	97,69
839 Memmingen	739 Regensburg *(0,2265)*	819 Donauwörth *(0,1702)*	827 Ingolstadt *(0,1675)*	831 Kempten *(0,1071)*	661 Ravensburg *(0,0653)*	73,66
843 München	677 Stuttgart *(0,6132)*	624 Heidelberg *(0,0873)*	644 Mannheim *(0,0496)*	631 Karlsruhe *(0,0384)*	419 Frankfurt *(0,0380)*	82,65
847 Passau	815 Deggendorf *(0,8066)*	859 Traunstein *(0,1900)*	743 Schwandorf *(0,0033)*	851 Pfarrkirchen *(0,0000)*	835 Landshut *(0,0000)*	100,00
851 Pfarrkirchen	835 Landshut *(0,2453)*	739 Regensburg *(0,1662)*	855 Rosenheim *(0,1465)*	743 Schwandorf *(0,1453)*	755 Weißenburg *(0,0613)*	76,46
855 Rosenheim	863 Weilheim *(0,6955)*	831 Kempten *(0,1291)*	739 Regensburg *(0,0280)*	851 Pfarrkirchen *(0,0279)*	755 Weißenburg *(0,0271)*	90,76
859 Traunstein	847 Passau *(0,5899)*	815 Deggendorf *(0,3120)*	743 Schwandorf *(0,0647)*	851 Pfarrkirchen *(0,0177)*	835 Landshut *(0,0061)*	99,03
863 Weilheim	855 Rosenheim *(0,7316)*	831 Kempten *(0,1861)*	719 Bamberg *(0,0131)*	739 Regensburg *(0,0123)*	755 Weißenburg *(0,0123)*	95,53
900 Berlin	75 Leipzig *(0,4326)*	74 Dresden *(0,2265)*	44 Halle *(0,0737)*	231 Göttingen *(0,0464)*	333 Dortmund *(0,0427)*	82,19

Table 6. Estimated benchmark groups (average for 2008); 5 nearest neighbors and normalized weights in brackets

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
31 Neubrandenburg	36 Eberswalde *(0,3070)*	48 Stendal *(0,1597)*	47 Sangerhausen *(0,1063)*	37 Frankfurt/Oder *(0,0936)*	72 Bautzen *(0,0565)*	72,31
32 Rostock	33 Schwerin *(0,4401)*	45 Magdeburg *(0,1334)*	38 Neuruppin *(0,0717)*	42 Dessau *(0,0396)*	48 Stendal *(0,0337)*	71,84
33 Schwerin	38 Neuruppin *(0,2413)*	32 Rostock *(0,1944)*	45 Magdeburg *(0,1295)*	37 Frankfurt/Oder *(0,0718)*	79 Riesa *(0,0522)*	68,92
34 Stralsund	31 Neubrandenburg *(0,9766)*	32 Rostock *(0,0151)*	37 Frankfurt/Oder *(0,0033)*	36 Eberswalde *(0,0012)*	47 Sangerhausen *(0,0009)*	99,71
35 Cottbus	72 Bautzen *(0,3664)*	37 Frankfurt/Oder *(0,1635)*	46 Merseburg *(0,1494)*	42 Dessau *(0,0689)*	70 Altenburg *(0,0526)*	80,08
36 Eberswalde	38 Neuruppin *(0,3175)*	31 Neubrandenburg *(0,1682)*	37 Frankfurt/Oder *(0,1426)*	72 Bautzen *(0,0761)*	47 Sangerhausen *(0,0508)*	75,51
37 Frankfurt/Oder	49 Wittenberg *(0,1383)*	35 Cottbus *(0,1270)*	38 Neuruppin *(0,1055)*	72 Bautzen *(0,1013)*	36 Eberswalde *(0,0721)*	54,42
38 Neuruppin	33 Schwerin *(0,1498)*	48 Stendal *(0,1413)*	36 Eberswalde *(0,1359)*	49 Wittenberg *(0,1049)*	37 Frankfurt/Oder *(0,1012)*	63,30
39 Potsdam	45 Magdeburg *(0,3259)*	44 Halle *(0,1473)*	93 Erfurt *(0,1126)*	96 Jena *(0,0838)*	73 Chemnitz *(0,0376)*	70,71
42 Dessau	45 Magdeburg *(0,1633)*	44 Halle *(0,1575)*	49 Wittenberg *(0,0990)*	46 Merseburg *(0,0895)*	94 Gera *(0,0601)*	56,94
43 Halberstadt	97 Nordhausen *(0,1514)*	49 Wittenberg *(0,1414)*	94 Gera *(0,1179)*	78 Plauen *(0,0770)*	76 Oschatz *(0,0684)*	55,61
44 Halle	75 Leipzig *(0,2658)*	93 Erfurt *(0,2302)*	45 Magdeburg *(0,1588)*	42 Dessau *(0,1279)*	73 Chemnitz *(0,0628)*	84,54
45 Magdeburg	44 Halle *(0,2020)*	42 Dessau *(0,1589)*	93 Erfurt *(0,1451)*	39 Potsdam *(0,1197)*	96 Jena *(0,0792)*	70,49
46 Merseburg	42 Dessau *(0,1876)*	35 Cottbus *(0,1461)*	93 Erfurt *(0,0774)*	79 Riesa *(0,0744)*	70 Altenburg *(0,0660)*	55,15
47 Sangerhausen	48 Stendal *(0,1884)*	43 Halberstadt *(0,1086)*	70 Altenburg *(0,1067)*	31 Neubrandenburg *(0,0977)*	36 Eberswalde *(0,0759)*	57,73
48 Stendal	38 Neuruppin *(0,1930)*	49 Wittenberg *(0,1270)*	76 Oschatz *(0,1262)*	47 Sangerhausen *(0,1204)*	43 Halberstadt *(0,0865)*	65,30
49 Wittenberg	76 Oschatz *(0,2716)*	94 Gera *(0,0940)*	42 Dessau *(0,0698)*	43 Halberstadt *(0,0677)*	79 Riesa *(0,0658)*	56,88
70 Altenburg	94 Gera *(0,2185)*	72 Bautzen *(0,1175)*	76 Oschatz *(0,1132)*	47 Sangerhausen *(0,0978)*	78 Plauen *(0,0796)*	62,66
71 Annaberg-B.	76 Oschatz *(0,4154)*	78 Plauen *(0,1408)*	70 Altenburg *(0,1297)*	97 Nordhausen *(0,0722)*	77 Pirna *(0,0639)*	82,19
72 Bautzen	35 Cottbus *(0,2640)*	49 Wittenberg *(0,1237)*	37 Frankfurt/Oder *(0,0941)*	70 Altenburg *(0,0774)*	79 Riesa *(0,0707)*	62,99
73 Chemnitz	92 Zwickau *(0,6261)*	44 Halle *(0,0859)*	93 Erfurt *(0,0726)*	96 Jena *(0,0677)*	45 Magdeburg *(0,0473)*	89,96
74 Dresden	75 Leipzig *(0,3386)*	39 Potsdam *(0,2432)*	900 Berlin *(0,1190)*	44 Halle *(0,0672)*	93 Erfurt *(0,0336)*	80,15
75 Leipzig	44 Halle *(0,7302)*	93 Erfurt *(0,1375)*	74 Dresden *(0,0271)*	39 Potsdam *(0,0182)*	46 Merseburg *(0,0169)*	92,99
76 Oschatz	49 Wittenberg *(0,3875)*	97 Nordhausen *(0,1115)*	77 Pirna *(0,0724)*	48 Stendal *(0,0674)*	70 Altenburg *(0,0582)*	69,70
77 Pirna	76 Oschatz *(0,2379)*	79 Riesa *(0,1987)*	49 Wittenberg *(0,1124)*	78 Plauen *(0,0739)*	43 Halberstadt *(0,0738)*	69,68
78 Plauen	94 Gera *(0,5523)*	92 Zwickau *(0,0766)*	98 Suhl *(0,0567)*	49 Wittenberg *(0,0475)*	43 Halberstadt *(0,0438)*	77,69
79 Riesa	49 Wittenberg *(0,1335)*	94 Gera *(0,0836)*	42 Dessau *(0,0792)*	77 Pirna *(0,0739)*	72 Bautzen *(0,0658)*	43,60
92 Zwickau	73 Chemnitz *(0,6393)*	78 Plauen *(0,0950)*	96 Jena *(0,0820)*	94 Gera *(0,0630)*	93 Erfurt *(0,0270)*	90,63
93 Erfurt	44 Halle *(0,2610)*	96 Jena *(0,2604)*	45 Magdeburg *(0,1320)*	73 Chemnitz *(0,0583)*	75 Leipzig *(0,0563)*	76,80
94 Gera	78 Plauen *(0,3775)*	96 Jena *(0,0844)*	49 Wittenberg *(0,0836)*	70 Altenburg *(0,0505)*	43 Halberstadt *(0,0467)*	64,25
95 Gotha	98 Suhl *(0,5771)*	96 Jena *(0,1067)*	94 Gera *(0,0794)*	78 Plauen *(0,0563)*	43 Halberstadt *(0,0531)*	87,26
96 Jena	93 Erfurt *(0,3161)*	94 Gera *(0,1471)*	45 Magdeburg *(0,0869)*	95 Gotha *(0,0767)*	92 Zwickau *(0,0746)*	70,14
97 Nordhausen	76 Oschatz *(0,3402)*	43 Halberstadt *(0,2295)*	49 Wittenberg *(0,1372)*	48 Stendal *(0,0595)*	94 Gera *(0,0470)*	81,33
98 Suhl	95 Gotha *(0,6052)*	94 Gera *(0,1102)*	78 Plauen *(0,0959)*	96 Jena *(0,0944)*	43 Halberstadt *(0,0204)*	92,60
111 Bad Oldesloe	139 Neumünster *(0,1903)*	115 Elmshorn *(0,1805)*	277 Verden *(0,0795)*	264 Osnabrück *(0,0675)*	221 Celle *(0,0627)*	58,06
115 Elmshorn	111 Bad Oldesloe *(0,1906)*	261 Oldenburg *(0,1100)*	139 Neumünster *(0,0901)*	267 Stade *(0,0602)*	277 Verden *(0,0528)*	50,36
119 Flensburg	127 Heide *(0,2654)*	135 Lübeck *(0,1472)*	271 Uelzen *(0,0907)*	139 Neumünster *(0,0880)*	281 Wilhelmshaven *(0,0701)*	66,14
123 Hamburg	214 Bremen *(0,5969)*	337 Düsseldorf *(0,2265)*	419 Frankfurt *(0,0673)*	237 Hannover *(0,0436)*	357 Köln *(0,0434)*	97,77
127 Heide	119 Flensburg *(0,4314)*	267 Stade *(0,2408)*	224 Emden *(0,1321)*	135 Lübeck *(0,0480)*	271 Uelzen *(0,0449)*	89,72
131 Kiel	135 Lübeck *(0,0746)*	261 Oldenburg *(0,0672)*	244 Hildesheim *(0,0661)*	139 Neumünster *(0,0652)*	115 Elmshorn *(0,0573)*	33,03
135 Lübeck	271 Uelzen *(0,1438)*	119 Flensburg *(0,1370)*	227 Goslar *(0,0843)*	139 Neumünster *(0,0830)*	281 Wilhelmshaven *(0,0785)*	52,65
139 Neumünster	111 Bad Oldesloe *(0,1536)*	277 Verden *(0,1362)*	251 Lüneburg *(0,1323)*	221 Celle *(0,0917)*	261 Oldenburg *(0,0879)*	60,17
211 Braunschweig	237 Hannover *(0,2275)*	244 Hildesheim *(0,0724)*	347 Hagen *(0,0700)*	214 Bremen *(0,0670)*	435 Kassel *(0,0599)*	49,68
214 Bremen	237 Hannover *(0,3877)*	211 Braunschweig *(0,1564)*	123 Hamburg *(0,0639)*	347 Hagen *(0,0379)*	317 Bielefeld *(0,0299)*	67,58

(continued)

Table 6. Estimated benchmark groups (average for 2008); 5 nearest neighbors and normalized weights in brackets (continued)

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
217 Bremerhaven	281 Wilhelmshaven *(0,4466)*	261 Oldenburg *(0,1788)*	267 Stade *(0,0801)*	131 Kiel *(0,0366)*	221 Celle *(0,0268)*	76,90
221 Celle	277 Verden *(0,1247)*	244 Hildesheim *(0,1040)*	254 Nienburg *(0,0838)*	261 Oldenburg *(0,0808)*	234 Hameln *(0,0633)*	45,66
224 Emden	127 Heide *(0,7943)*	439 Korbach *(0,0347)*	247 Leer *(0,0298)*	119 Flensburg *(0,0287)*	531 Mayen *(0,0123)*	89,99
227 Goslar	231 Göttingen *(0,3668)*	244 Hildesheim *(0,1878)*	234 Hameln *(0,1661)*	221 Celle *(0,0384)*	135 Lübeck *(0,0347)*	79,38
231 Göttingen	227 Goslar *(0,1885)*	244 Hildesheim *(0,1612)*	234 Hameln *(0,1378)*	331 Detmold *(0,1331)*	353 Herford *(0,0423)*	66,27
234 Hameln	244 Hildesheim *(0,2584)*	331 Detmold *(0,2265)*	231 Göttingen *(0,1010)*	221 Celle *(0,0746)*	227 Goslar *(0,0659)*	72,65
237 Hannover	211 Braunschweig *(0,3545)*	214 Bremen *(0,2532)*	357 Köln *(0,0497)*	333 Dortmund *(0,0448)*	391 Wuppertal *(0,0238)*	72,59
241 Helmstedt	211 Braunschweig *(0,5299)*	355 Iserlohn *(0,0679)*	381 Siegen *(0,0599)*	523 Ludwigshafen *(0,0322)*	317 Bielefeld *(0,0298)*	71,96
244 Hildesheim	234 Hameln *(0,1957)*	331 Detmold *(0,1287)*	221 Celle *(0,0912)*	231 Göttingen *(0,0906)*	353 Herford *(0,0687)*	57,49
247 Leer	274 Vechta *(0,7060)*	254 Nienburg *(0,0701)*	535 Montabaur *(0,0511)*	257 Nordhorn *(0,0344)*	411 Bad Hersfeld *(0,0186)*	88,03
251 Lüneburg	139 Neumünster *(0,2457)*	221 Celle *(0,1730)*	277 Verden *(0,1371)*	271 Uelzen *(0,0791)*	111 Bad Oldesloe *(0,0722)*	70,71
254 Nienburg	221 Celle *(0,2228)*	277 Verden *(0,1082)*	261 Oldenburg *(0,0423)*	267 Stade *(0,0404)*	331 Detmold *(0,0395)*	45,32
257 Nordhorn	377 Rheine *(0,2761)*	274 Vechta *(0,2285)*	327 Coesfeld *(0,1762)*	313 Ahlen *(0,0436)*	264 Osnabrück *(0,0372)*	76,16
261 Oldenburg	281 Wilhelmshaven *(0,1804)*	221 Celle *(0,0896)*	277 Verden *(0,0805)*	264 Osnabrück *(0,0729)*	139 Neumünster *(0,0551)*	47,85
264 Osnabrück	377 Rheine *(0,2214)*	353 Herford *(0,1556)*	313 Ahlen *(0,0684)*	383 Soest *(0,0581)*	373 Paderborn *(0,0573)*	56,08
267 Stade	139 Neumünster *(0,1471)*	277 Verden *(0,1202)*	115 Elmshorn *(0,1066)*	221 Celle *(0,1049)*	261 Oldenburg *(0,0968)*	57,56
271 Uelzen	251 Lüneburg *(0,1796)*	221 Celle *(0,1362)*	135 Lübeck *(0,1279)*	254 Nienburg *(0,1062)*	119 Flensburg *(0,0803)*	63,03
274 Vechta	247 Leer *(0,5187)*	257 Nordhorn *(0,2435)*	535 Montabaur *(0,0793)*	254 Nienburg *(0,0366)*	747 Schweinfurt *(0,0214)*	89,96
277 Verden	221 Celle *(0,1902)*	139 Neumünster *(0,1172)*	261 Oldenburg *(0,1110)*	251 Lüneburg *(0,0643)*	264 Osnabrück *(0,0627)*	54,56
281 Wilhelmshaven	261 Oldenburg *(0,4351)*	217 Bremerhaven *(0,1883)*	221 Celle *(0,0561)*	135 Lübeck *(0,0256)*	234 Hameln *(0,0238)*	72,90
311 Aachen	335 Düren *(0,1824)*	385 Solingen *(0,1279)*	361 Krefeld *(0,0861)*	347 Hagen *(0,0802)*	321 Bochum *(0,0681)*	54,46
313 Ahlen	383 Soest *(0,1687)*	377 Rheine *(0,1324)*	317 Bielefeld *(0,0954)*	264 Osnabrück *(0,0809)*	373 Paderborn *(0,0776)*	55,51
315 Bergisch Gladb.	385 Solingen *(0,1848)*	347 Hagen *(0,1827)*	365 Mönchengladb. *(0,1078)*	361 Krefeld *(0,0828)*	391 Wuppertal *(0,0708)*	62,89
317 Bielefeld	373 Paderborn *(0,1765)*	383 Soest *(0,1671)*	313 Ahlen *(0,1258)*	353 Herford *(0,0722)*	264 Osnabrück *(0,0640)*	60,57
321 Bochum	347 Hagen *(0,2547)*	391 Wuppertal *(0,1487)*	371 Oberhausen *(0,0944)*	343 Essen *(0,0792)*	333 Dortmund *(0,0697)*	64,68
323 Bonn	527 Mainz *(0,1643)*	459 Wiesbaden *(0,1010)*	385 Solingen *(0,0918)*	415 Darmstadt *(0,0796)*	367 Münster *(0,0538)*	49,05
325 Brühl	335 Düren *(0,5569)*	365 Mönchengladb. *(0,2255)*	361 Krefeld *(0,0768)*	315 Bergisch Gladb. *(0,0454)*	347 Hagen *(0,0183)*	92,29
327 Coesfeld	377 Rheine *(0,3888)*	313 Ahlen *(0,1355)*	264 Osnabrück *(0,0570)*	387 Wesel *(0,0461)*	547 Neuwied *(0,0421)*	66,96
331 Detmold	353 Herford *(0,2355)*	234 Hameln *(0,1249)*	373 Paderborn *(0,1038)*	244 Hildesheim *(0,0964)*	231 Göttingen *(0,0568)*	61,73
333 Dortmund	345 Gelsenkirchen *(0,1550)*	321 Bochum *(0,1489)*	341 Duisburg *(0,1213)*	343 Essen *(0,1133)*	391 Wuppertal *(0,1077)*	64,62
335 Düren	311 Aachen *(0,1313)*	325 Brühl *(0,1234)*	361 Krefeld *(0,1063)*	385 Solingen *(0,0981)*	365 Mönchengladb. *(0,0929)*	55,20
337 Düsseldorf	357 Köln *(0,6528)*	419 Frankfurt *(0,1825)*	123 Hamburg *(0,0460)*	343 Essen *(0,0410)*	237 Hannover *(0,0136)*	93,60
341 Duisburg	371 Oberhausen *(0,3395)*	333 Dortmund *(0,1415)*	343 Essen *(0,1357)*	391 Wuppertal *(0,1093)*	321 Bochum *(0,0820)*	80,81
343 Essen	321 Bochum *(0,2283)*	371 Oberhausen *(0,2192)*	341 Duisburg *(0,1690)*	333 Dortmund *(0,1623)*	391 Wuppertal *(0,0796)*	85,83
345 Gelsenkirchen	375 Recklinghausen *(0,5222)*	333 Dortmund *(0,1193)*	371 Oberhausen *(0,1137)*	321 Bochum *(0,0773)*	391 Wuppertal *(0,0522)*	88,46
347 Hagen	385 Solingen *(0,2426)*	391 Wuppertal *(0,1942)*	321 Bochum *(0,1199)*	361 Krefeld *(0,0743)*	315 Bergisch Gladb. *(0,0553)*	68,63
351 Hamm	383 Soest *(0,1323)*	347 Hagen *(0,1233)*	385 Solingen *(0,0704)*	331 Detmold *(0,0683)*	375 Recklinghausen *(0,0494)*	44,37
353 Herford	331 Detmold *(0,2340)*	264 Osnabrück *(0,1344)*	383 Soest *(0,0799)*	373 Paderborn *(0,0590)*	244 Hildesheim *(0,0509)*	55,82
355 Iserlohn	385 Solingen *(0,1385)*	381 Siegen *(0,1262)*	383 Soest *(0,1239)*	347 Hagen *(0,1187)*	313 Ahlen *(0,0670)*	57,43
357 Köln	337 Düsseldorf *(0,4792)*	343 Essen *(0,1127)*	237 Hannover *(0,0941)*	341 Duisburg *(0,0552)*	323 Bonn *(0,0542)*	79,53
361 Krefeld	365 Mönchengladb. *(0,4631)*	347 Hagen *(0,1190)*	385 Solingen *(0,0738)*	391 Wuppertal *(0,0641)*	335 Düren *(0,0415)*	76,15
363 Meschede	383 Soest *(0,1317)*	373 Paderborn *(0,0870)*	547 Neuwied *(0,0810)*	381 Siegen *(0,0775)*	313 Ahlen *(0,0732)*	45,03
365 Mönchengladb.	361 Krefeld *(0,5272)*	391 Wuppertal *(0,1020)*	347 Hagen *(0,0906)*	315 Bergisch Gladb. *(0,0595)*	335 Düren *(0,0415)*	82,08
367 Münster	323 Bonn *(0,3013)*	317 Bielefeld *(0,1446)*	237 Hannover *(0,1336)*	459 Wiesbaden *(0,1103)*	357 Köln *(0,0487)*	73,85

(continued)

Table 6. Estimated benchmark groups (average for 2008); 5 nearest neighbors and normalized weights in brackets (continued)

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
371 Oberhausen	341 Duisburg *(0,2402)*	345 Gelsenkirchen *(0,1295)*	321 Bochum *(0,1260)*	343 Essen *(0,1177)*	361 Krefeld *(0,0699)*	68,33
373 Paderborn	331 Detmold *(0,1241)*	317 Bielefeld *(0,1166)*	383 Soest *(0,1109)*	353 Herford *(0,0718)*	313 Ahlen *(0,0695)*	49,28
375 Recklinghausen	345 Gelsenkirchen *(0,6121)*	351 Hamm *(0,0637)*	333 Dortmund *(0,0553)*	321 Bochum *(0,0482)*	391 Wuppertal *(0,0346)*	81,39
377 Rheine	264 Osnabrück *(0,2843)*	327 Coesfeld *(0,1876)*	313 Ahlen *(0,1432)*	373 Paderborn *(0,0488)*	383 Soest *(0,0403)*	70,42
381 Siegen	355 Iserlohn *(0,2345)*	363 Meschede *(0,1698)*	455 Wetzlar *(0,1039)*	547 Neuwied *(0,0961)*	313 Ahlen *(0,0708)*	67,51
383 Soest	313 Ahlen *(0,1198)*	317 Bielefeld *(0,0921)*	373 Paderborn *(0,0872)*	353 Herford *(0,0768)*	363 Meschede *(0,0743)*	45,02
385 Solingen	347 Hagen *(0,2902)*	391 Wuppertal *(0,2301)*	315 Bergisch Gladb. *(0,0672)*	361 Krefeld *(0,0566)*	355 Iserlohn *(0,0459)*	68,99
387 Wesel	353 Herford *(0,0625)*	264 Osnabrück *(0,0494)*	331 Detmold *(0,0469)*	244 Hildesheim *(0,0450)*	361 Krefeld *(0,0449)*	24,86
391 Wuppertal	385 Solingen *(0,2699)*	347 Hagen *(0,2671)*	321 Bochum *(0,0992)*	365 Mönchengladb. *(0,0722)*	361 Krefeld *(0,0530)*	76,15
411 Bad Hersfeld	423 Fulda *(0,2424)*	443 Limburg *(0,1249)*	431 Hanau *(0,0674)*	221 Celle *(0,0537)*	547 Neuwied *(0,0455)*	53,39
415 Darmstadt	644 Mannheim *(0,2407)*	527 Mainz *(0,1458)*	451 Offenbach *(0,1335)*	523 Ludwigshafen *(0,1158)*	459 Wiesbaden *(0,0364)*	67,22
419 Frankfurt	337 Düsseldorf *(0,6803)*	677 Stuttgart *(0,2259)*	123 Hamburg *(0,0459)*	357 Köln *(0,0258)*	459 Wiesbaden *(0,0081)*	98,60
423 Fulda	411 Bad Hersfeld *(0,1882)*	547 Neuwied *(0,0818)*	511 Bad Kreuznach *(0,0675)*	363 Meschede *(0,0631)*	431 Hanau *(0,0608)*	46,13
427 Gießen	431 Hanau *(0,2405)*	443 Limburg *(0,0896)*	244 Hildesheim *(0,0448)*	373 Paderborn *(0,0418)*	331 Detmold *(0,0336)*	45,03
431 Hanau	427 Gießen *(0,2135)*	443 Limburg *(0,0682)*	539 Neunkirchen *(0,0599)*	547 Neuwied *(0,0394)*	423 Fulda *(0,0375)*	41,86
435 Kassel	373 Paderborn *(0,1431)*	383 Soest *(0,1062)*	317 Bielefeld *(0,0954)*	211 Braunschweig *(0,0716)*	231 Göttingen *(0,0455)*	46,18
439 Korbach	531 Mayen *(0,1439)*	363 Meschede *(0,1378)*	563 Trier *(0,0879)*	423 Fulda *(0,0706)*	747 Schweinfurt *(0,0625)*	50,27
443 Limburg	427 Gießen *(0,1173)*	431 Hanau *(0,0955)*	547 Neuwied *(0,0894)*	535 Montabaur *(0,0885)*	411 Bad Hersfeld *(0,0840)*	47,47
447 Marburg	439 Korbach *(0,5450)*	519 Koblenz *(0,0971)*	563 Trier *(0,0549)*	531 Mayen *(0,0436)*	719 Bamberg *(0,0433)*	78,40
451 Offenbach	415 Darmstadt *(0,3117)*	644 Mannheim *(0,0850)*	361 Krefeld *(0,0731)*	365 Mönchengladb. *(0,0547)*	347 Hagen *(0,0495)*	57,41
455 Wetzlar	381 Siegen *(0,1916)*	317 Bielefeld *(0,1108)*	373 Paderborn *(0,0724)*	355 Iserlohn *(0,0700)*	431 Hanau *(0,0546)*	49,94
459 Wiesbaden	527 Mainz *(0,5062)*	415 Darmstadt *(0,1022)*	323 Bonn *(0,0673)*	644 Mannheim *(0,0662)*	631 Karlsruhe *(0,0289)*	77,08
511 Bad Kreuznach	515 Kaiserslautern *(0,2045)*	547 Neuwied *(0,1292)*	519 Koblenz *(0,0942)*	531 Mayen *(0,0832)*	563 Trier *(0,0563)*	56,74
515 Kaiserslautern	511 Bad Kreuznach *(0,2039)*	551 Pirmasens *(0,1446)*	539 Neunkirchen *(0,1247)*	543 Landau *(0,0967)*	559 Saarlouis *(0,0577)*	62,76
519 Koblenz	511 Bad Kreuznach *(0,1941)*	531 Mayen *(0,1812)*	563 Trier *(0,0968)*	547 Neuwied *(0,0886)*	515 Kaiserslautern *(0,0544)*	61,51
523 Ludwigshafen	644 Mannheim *(0,2610)*	415 Darmstadt *(0,2209)*	631 Karlsruhe *(0,0707)*	315 Bergisch Gladb. *(0,0580)*	527 Mainz *(0,0457)*	65,64
527 Mainz	459 Wiesbaden *(0,2499)*	415 Darmstadt *(0,2031)*	323 Bonn *(0,0531)*	539 Neunkirchen *(0,0415)*	654 Pforzheim *(0,0391)*	58,68
531 Mayen	563 Trier *(0,2629)*	535 Montabaur *(0,2081)*	547 Neuwied *(0,1411)*	519 Koblenz *(0,1047)*	511 Bad Kreuznach *(0,1013)*	81,82
535 Montabaur	531 Mayen *(0,2842)*	547 Neuwied *(0,2402)*	443 Limburg *(0,1007)*	511 Bad Kreuznach *(0,0878)*	563 Trier *(0,0863)*	79,91
539 Neunkirchen	559 Saarlouis *(0,2057)*	515 Kaiserslautern *(0,1218)*	555 Saarbrücken *(0,1068)*	543 Landau *(0,0553)*	431 Hanau *(0,0502)*	53,98
543 Landau	651 Offenburg *(0,0965)*	515 Kaiserslautern *(0,0873)*	559 Saarlouis *(0,0741)*	681 Tauberbischofsh. *(0,0666)*	654 Pforzheim *(0,0593)*	38,38
547 Neuwied	511 Bad Kreuznach *(0,1155)*	535 Montabaur *(0,1031)*	531 Mayen *(0,1011)*	363 Meschede *(0,0803)*	443 Limburg *(0,0467)*	44,67
551 Pirmasens	515 Kaiserslautern *(0,3357)*	511 Bad Kreuznach *(0,0938)*	543 Landau *(0,0701)*	539 Neunkirchen *(0,0635)*	427 Gießen *(0,0401)*	60,32
555 Saarbrücken	539 Neunkirchen *(0,2755)*	559 Saarlouis *(0,0562)*	385 Solingen *(0,0466)*	523 Ludwigshafen *(0,0454)*	527 Mainz *(0,0445)*	46,81
559 Saarlouis	539 Neunkirchen *(0,2632)*	543 Landau *(0,1001)*	515 Kaiserslautern *(0,0715)*	547 Neuwied *(0,0620)*	511 Bad Kreuznach *(0,0537)*	55,05
563 Trier	531 Mayen *(0,3744)*	511 Bad Kreuznach *(0,1222)*	519 Koblenz *(0,1013)*	535 Montabaur *(0,0891)*	439 Korbach *(0,0528)*	73,97
611 Aalen	671 Waiblingen *(0,2343)*	621 Göppingen *(0,1140)*	641 Ludwigsburg *(0,1021)*	684 Ulm *(0,0950)*	657 Rastatt *(0,0797)*	62,51
614 Balingen	651 Offenburg *(0,1609)*	664 Reutlingen *(0,1158)*	543 Landau *(0,0794)*	671 Waiblingen *(0,0765)*	637 Lörrach *(0,0679)*	50,04
617 Freiburg	664 Reutlingen *(0,2382)*	637 Lörrach *(0,1932)*	634 Konstanz *(0,1205)*	651 Offenburg *(0,1083)*	687 Vill.-Schwenn. *(0,0516)*	71,18
621 Göppingen	627 Heilbronn *(0,2479)*	684 Ulm *(0,2476)*	611 Aalen *(0,1230)*	661 Ravensburg *(0,1211)*	671 Waiblingen *(0,1001)*	83,97
624 Heidelberg	644 Mannheim *(0,3969)*	631 Karlsruhe *(0,3049)*	641 Ludwigsburg *(0,0472)*	664 Reutlingen *(0,0405)*	415 Darmstadt *(0,0382)*	82,76
627 Heilbronn	621 Göppingen *(0,3097)*	684 Ulm *(0,1312)*	611 Aalen *(0,1053)*	641 Ludwigsburg *(0,0789)*	671 Waiblingen *(0,0747)*	69,98
631 Karlsruhe	644 Mannheim *(0,1921)*	654 Pforzheim *(0,1642)*	624 Heidelberg *(0,1490)*	641 Ludwigsburg *(0,1456)*	671 Waiblingen *(0,0579)*	70,88
634 Konstanz	617 Freiburg *(0,1824)*	664 Reutlingen *(0,1564)*	614 Balingen *(0,0799)*	687 Vill.-Schwenn. *(0,0692)*	651 Offenburg *(0,0624)*	55,03

(continued)

Table 6. Estimated benchmark groups (average for 2008); 5 nearest neighbors and normalized weights in brackets (continued)

Labor agency	1th neighbor	2nd neighbor	3rd neighbor	4th neighbor	5th neighbor	$\sum$ in %
637 Lörrach	687 Vill.-Schwenn. *(0,2322)*	651 Offenburg *(0,1735)*	617 Freiburg *(0,1550)*	614 Balingen *(0,0807)*	543 Landau *(0,0424)*	68,37
641 Ludwigsburg	671 Waiblingen *(0,3825)*	631 Karlsruhe *(0,1143)*	654 Pforzheim *(0,1104)*	644 Mannheim *(0,0671)*	611 Aalen *(0,0645)*	73,88
644 Mannheim	415 Darmstadt *(0,2295)*	624 Heidelberg *(0,1723)*	631 Karlsruhe *(0,1707)*	523 Ludwigshafen *(0,1370)*	641 Ludwigsburg *(0,0731)*	78,27
647 Nagold	651 Offenburg *(0,2515)*	543 Landau *(0,1598)*	614 Balingen *(0,0990)*	657 Rastatt *(0,0786)*	681 Tauberbischofsh. *(0,0477)*	63,65
651 Offenburg	614 Balingen *(0,1157)*	543 Landau *(0,1140)*	637 Lörrach *(0,1047)*	647 Nagold *(0,0980)*	687 Vill.-Schwenn. *(0,0726)*	50,50
654 Pforzheim	671 Waiblingen *(0,1575)*	631 Karlsruhe *(0,1565)*	641 Ludwigsburg *(0,1376)*	543 Landau *(0,0584)*	664 Reutlingen *(0,0453)*	55,52
657 Rastatt	611 Aalen *(0,1428)*	641 Ludwigsburg *(0,0941)*	651 Offenburg *(0,0820)*	627 Heilbronn *(0,0786)*	671 Waiblingen *(0,0781)*	47,55
661 Ravensburg	684 Ulm *(0,3727)*	621 Göppingen *(0,1482)*	667 Rottweil *(0,1219)*	611 Aalen *(0,0968)*	687 Vill.-Schwenn. *(0,0825)*	82,21
664 Reutlingen	671 Waiblingen *(0,1534)*	617 Freiburg *(0,1511)*	614 Balingen *(0,1229)*	631 Karlsruhe *(0,0998)*	654 Pforzheim *(0,0812)*	60,85
667 Rottweil	687 Vill.-Schwenn. *(0,2947)*	661 Ravensburg *(0,2110)*	657 Rastatt *(0,0856)*	651 Offenburg *(0,0721)*	611 Aalen *(0,0638)*	72,73
671 Waiblingen	641 Ludwigsburg *(0,3238)*	611 Aalen *(0,1254)*	654 Pforzheim *(0,1059)*	664 Reutlingen *(0,0584)*	621 Göppingen *(0,0581)*	67,15
674 Schwäb. Hall	684 Ulm *(0,3848)*	627 Heilbronn *(0,2245)*	621 Göppingen *(0,1610)*	661 Ravensburg *(0,1105)*	687 Vill.-Schwenn. *(0,0389)*	91,97
677 Stuttgart	419 Frankfurt *(0,3006)*	843 München *(0,1973)*	641 Ludwigsburg *(0,1195)*	624 Heidelberg *(0,1161)*	644 Mannheim *(0,0684)*	80,17
681 Tauberbischofsh.	543 Landau *(0,1224)*	759 Würzburg *(0,1019)*	651 Offenburg *(0,0826)*	715 Aschaffenburg *(0,0580)*	671 Waiblingen *(0,0524)*	41,72
684 Ulm	661 Ravensburg *(0,3248)*	621 Göppingen *(0,2816)*	627 Heilbronn *(0,1193)*	611 Aalen *(0,1032)*	687 Vill.-Schwenn. *(0,0569)*	88,58
687 Vill.-Schwenn.	667 Rottweil *(0,1956)*	637 Lörrach *(0,1844)*	661 Ravensburg *(0,0998)*	651 Offenburg *(0,0981)*	684 Ulm *(0,0865)*	66,44
711 Ansbach	755 Weißenburg *(0,5164)*	743 Schwandorf *(0,3055)*	751 Weiden *(0,1279)*	851 Pfarrkirchen *(0,0231)*	863 Weilheim *(0,0051)*	97,80
715 Aschaffenburg	747 Schweinfurt *(0,3014)*	759 Würzburg *(0,2173)*	681 Tauberbischofsh. *(0,0712)*	719 Bamberg *(0,0658)*	543 Landau *(0,0389)*	69,46
719 Bamberg	727 Coburg *(0,2025)*	747 Schweinfurt *(0,1852)*	723 Bayreuth *(0,1567)*	759 Würzburg *(0,0755)*	715 Aschaffenburg *(0,0650)*	68,47
723 Bayreuth	731 Hof *(0,4811)*	751 Weiden *(0,1732)*	719 Bamberg *(0,1612)*	727 Coburg *(0,0929)*	755 Weißenburg *(0,0485)*	95,70
727 Coburg	731 Hof *(0,4058)*	719 Bamberg *(0,2460)*	723 Bayreuth *(0,1146)*	759 Würzburg *(0,0427)*	747 Schweinfurt *(0,0422)*	85,13
731 Hof	723 Bayreuth *(0,5065)*	727 Coburg *(0,3491)*	751 Weiden *(0,0595)*	719 Bamberg *(0,0494)*	755 Weißenburg *(0,0160)*	98,04
735 Nürnberg	631 Karlsruhe *(0,2146)*	671 Waiblingen *(0,0788)*	641 Ludwigsburg *(0,0661)*	644 Mannheim *(0,0583)*	624 Heidelberg *(0,0550)*	47,28
739 Regensburg	827 Ingolstadt *(0,2740)*	819 Donauwörth *(0,1314)*	851 Pfarrkirchen *(0,1169)*	835 Landshut *(0,0856)*	839 Memmingen *(0,0822)*	69,02
743 Schwandorf	751 Weiden *(0,4112)*	711 Ansbach *(0,2688)*	815 Deggendorf *(0,1689)*	835 Landshut *(0,0479)*	851 Pfarrkirchen *(0,0343)*	93,10
747 Schweinfurt	715 Aschaffenburg *(0,2813)*	759 Würzburg *(0,1863)*	719 Bamberg *(0,1681)*	423 Fulda *(0,0607)*	727 Coburg *(0,0346)*	73,10
751 Weiden	723 Bayreuth *(0,3398)*	755 Weißenburg *(0,2133)*	743 Schwandorf *(0,1384)*	731 Hof *(0,1154)*	719 Bamberg *(0,0538)*	86,08
755 Weißenburg	711 Ansbach *(0,3007)*	751 Weiden *(0,2289)*	719 Bamberg *(0,1324)*	723 Bayreuth *(0,1074)*	819 Donauwörth *(0,0604)*	82,97
759 Würzburg	715 Aschaffenburg *(0,2040)*	747 Schweinfurt *(0,1844)*	681 Tauberbischofsh. *(0,1068)*	719 Bamberg *(0,0845)*	811 Augsburg *(0,0752)*	65,50
811 Augsburg	759 Würzburg *(0,1380)*	614 Balingen *(0,0933)*	543 Landau *(0,0667)*	634 Konstanz *(0,0628)*	651 Offenburg *(0,0454)*	40,61
815 Deggendorf	743 Schwandorf *(0,4885)*	847 Passau *(0,4056)*	859 Traunstein *(0,0951)*	711 Ansbach *(0,0091)*	851 Pfarrkirchen *(0,0008)*	99,92
819 Donauwörth	739 Regensburg *(0,2238)*	755 Weißenburg *(0,1390)*	827 Ingolstadt *(0,1253)*	839 Memmingen *(0,0915)*	719 Bamberg *(0,0899)*	66,94
823 Freising	739 Regensburg *(0,3354)*	839 Memmingen *(0,2763)*	827 Ingolstadt *(0,2579)*	863 Weilheim *(0,0519)*	855 Rosenheim *(0,0287)*	95,02
827 Ingolstadt	739 Regensburg *(0,4738)*	839 Memmingen *(0,2390)*	819 Donauwörth *(0,1406)*	835 Landshut *(0,1049)*	823 Freising *(0,0277)*	98,60
831 Kempten	855 Rosenheim *(0,3263)*	863 Weilheim *(0,0789)*	811 Augsburg *(0,0664)*	759 Würzburg *(0,0661)*	719 Bamberg *(0,0629)*	60,06
835 Landshut	851 Pfarrkirchen *(0,4275)*	739 Regensburg *(0,2815)*	827 Ingolstadt *(0,1720)*	743 Schwandorf *(0,0585)*	839 Memmingen *(0,0245)*	96,39
839 Memmingen	827 Ingolstadt *(0,3888)*	739 Regensburg *(0,2382)*	819 Donauwörth *(0,1178)*	851 Pfarrkirchen *(0,0859)*	823 Freising *(0,0583)*	88,89
843 München	624 Heidelberg *(0,3139)*	735 Nürnberg *(0,2094)*	677 Stuttgart *(0,1784)*	631 Karlsruhe *(0,0867)*	644 Mannheim *(0,0721)*	86,05
847 Passau	815 Deggendorf *(0,9434)*	859 Traunstein *(0,0556)*	743 Schwandorf *(0,0009)*	711 Ansbach *(0,0000)*	835 Landshut *(0,0000)*	100,00
851 Pfarrkirchen	835 Landshut *(0,3497)*	739 Regensburg *(0,3095)*	839 Memmingen *(0,0837)*	751 Weiden *(0,0607)*	755 Weißenburg *(0,0498)*	85,34
855 Rosenheim	863 Weilheim *(0,4276)*	831 Kempten *(0,2713)*	719 Bamberg *(0,0540)*	723 Bayreuth *(0,0483)*	739 Regensburg *(0,0381)*	83,93
859 Traunstein	847 Passau *(0,4983)*	815 Deggendorf *(0,3111)*	743 Schwandorf *(0,1667)*	863 Weilheim *(0,0090)*	711 Ansbach *(0,0082)*	99,34
863 Weilheim	855 Rosenheim *(0,6641)*	831 Kempten *(0,0970)*	739 Regensburg *(0,0714)*	755 Weißenburg *(0,0531)*	839 Memmingen *(0,0238)*	90,93
900 Berlin	75 Leipzig *(0,4649)*	74 Dresden *(0,2514)*	333 Dortmund *(0,0489)*	227 Goslar *(0,0340)*	39 Potsdam *(0,0313)*	83,06

Table 7. Estimated quantile positions (average for 2006)

Labor agency	QP (st.error)	Labor agency	QP (st.error)	Labor agency	QP (st.error)	Labor agency	QP (st.error)
47 Sangerhausen	0,0332 (0,0090)	443 Limburg	0,3559 (0,0214)	751 Weiden	0,5276 (0,0311)	863 Weilheim	0,6774 (0,0227)
92 Zwickau	0,0539 (0,0137)	743 Schwandorf	0,3562 (0,0192)	353 Herford	0,5304 (0,0457)	851 Pfarrkirchen	0,6778 (0,0239)
900 Berlin	0,1001 (0,0209)	72 Bautzen	0,3585 (0,0283)	355 Iserlohn	0,5321 (0,0388)	617 Freiburg	0,6817 (0,0390)
35 Cottbus	0,1103 (0,0160)	244 Hildesheim	0,3608 (0,0320)	261 Oldenburg	0,5360 (0,0198)	139 Neumünster	0,6823 (0,0192)
637 Lörrach	0,1135 (0,0324)	221 Celle	0,3614 (0,0260)	363 Meschede	0,5437 (0,0274)	257 Nordhorn	0,6824 (0,0361)
391 Wuppertal	0,1304 (0,0438)	827 Ingolstadt	0,3655 (0,0389)	664 Reutlingen	0,5497 (0,0344)	759 Würzburg	0,6838 (0,0332)
251 Lüneburg	0,1732 (0,0239)	677 Stuttgart	0,3681 (0,0202)	77 Pirna	0,5503 (0,0244)	835 Landshut	0,6905 (0,0294)
611 Aalen	0,1744 (0,0211)	351 Hamm	0,3705 (0,0329)	547 Neuwied	0,5524 (0,0247)	34 Stralsund	0,6930 (0,0118)
345 Gelsenkirchen	0,1789 (0,0414)	543 Landau	0,3735 (0,0264)	375 Recklinghausen	0,5630 (0,0358)	667 Rottweil	0,6943 (0,0281)
415 Darmstadt	0,1822 (0,0246)	371 Oberhausen	0,3745 (0,0388)	455 Wetzlar	0,5670 (0,0277)	254 Nienburg	0,6981 (0,0269)
361 Krefeld	0,1900 (0,0358)	70 Altenburg	0,3746 (0,0288)	97 Nordhausen	0,5706 (0,0225)	819 Donauwörth	0,7011 (0,0259)
654 Pforzheim	0,1992 (0,0235)	317 Bielefeld	0,3790 (0,0366)	95 Gotha	0,5742 (0,0344)	657 Rastatt	0,7038 (0,0291)
614 Balingen	0,2084 (0,0249)	38 Neuruppin	0,3850 (0,0212)	531 Mayen	0,5788 (0,0199)	563 Trier	0,7040 (0,0240)
237 Hannover	0,2111 (0,0289)	247 Leer	0,3882 (0,0058)	45 Magdeburg	0,5872 (0,0244)	33 Schwerin	0,7055 (0,0216)
731 Hof	0,2115 (0,0248)	75 Leipzig	0,3922 (0,0353)	647 Nagold	0,5874 (0,0409)	337 Düsseldorf	0,7109 (0,0203)
241 Helmstedt	0,2118 (0,0283)	111 Bad Oldesloe	0,4122 (0,0309)	49 Wittenberg	0,5905 (0,0193)	674 Schwäbisch Hall	0,7122 (0,0240)
36 Eberswalde	0,2121 (0,0141)	74 Dresden	0,4210 (0,0267)	447 Marburg	0,5950 (0,0407)	267 Stade	0,7127 (0,0227)
755 Weißenburg	0,2132 (0,0187)	79 Riesa	0,4259 (0,0173)	523 Ludwigshafen	0,5982 (0,0378)	331 Detmold	0,7133 (0,0308)
333 Dortmund	0,2285 (0,0532)	671 Waiblingen	0,4288 (0,0567)	624 Heidelberg	0,5984 (0,0369)	224 Emden	0,7158 (0,0293)
621 Göppingen	0,2324 (0,0459)	231 Göttingen	0,4409 (0,0354)	32 Rostock	0,5992 (0,0240)	73 Chemnitz	0,7235 (0,0441)
644 Mannheim	0,2383 (0,0278)	211 Braunschweig	0,4520 (0,0254)	815 Deggendorf	0,6003 (0,0225)	343 Essen	0,7238 (0,0592)
131 Kiel	0,2522 (0,0164)	727 Coburg	0,4566 (0,0337)	427 Gießen	0,6013 (0,0257)	381 Siegen	0,7263 (0,0384)
855 Rosenheim	0,2586 (0,0354)	264 Osnabrück	0,4569 (0,0361)	313 Ahlen	0,6050 (0,0286)	274 Vechta	0,7327 (0,0030)
93 Erfurt	0,2599 (0,0296)	327 Coesfeld	0,4576 (0,0494)	641 Ludwigsburg	0,6076 (0,0462)	227 Goslar	0,7330 (0,0416)
234 Hameln	0,2735 (0,0339)	31 Neubrandenburg	0,4659 (0,0171)	423 Fulda	0,6088 (0,0237)	527 Mainz	0,7388 (0,0183)
42 Dessau	0,2811 (0,0206)	385 Solingen	0,4705 (0,0602)	843 München	0,6112 (0,0220)	859 Traunstein	0,7551 (0,0097)
78 Plauen	0,2828 (0,0081)	115 Elmshorn	0,4710 (0,0218)	311 Aachen	0,6194 (0,0280)	48 Stendal	0,7586 (0,0185)
387 Wesel	0,2962 (0,0246)	37 Frankfurt (Oder)	0,4741 (0,0208)	46 Merseburg	0,6208 (0,0243)	823 Freising	0,7632 (0,0211)
811 Augsburg	0,2995 (0,0183)	559 Saarlouis	0,4742 (0,0414)	739 Regensburg	0,6244 (0,0121)	555 Saarbrücken	0,7679 (0,0299)
217 Bremerhaven	0,3002 (0,0176)	323 Bonn	0,4745 (0,0264)	627 Heilbronn	0,6263 (0,0519)	511 Bad Kreuznach	0,7693 (0,0204)
459 Wiesbaden	0,3080 (0,0291)	383 Soest	0,4770 (0,0282)	135 Lübeck	0,6272 (0,0183)	119 Flensburg	0,7784 (0,0148)
719 Bamberg	0,3114 (0,0244)	76 Oschatz	0,4846 (0,0293)	96 Jena	0,6298 (0,0309)	39 Potsdam	0,8276 (0,0141)
431 Hanau	0,3122 (0,0228)	715 Aschaffenburg	0,4878 (0,0282)	335 Düren	0,6301 (0,0275)	631 Karlsruhe	0,8340 (0,0267)
839 Memmingen	0,3132 (0,0236)	451 Offenbach	0,4914 (0,0406)	435 Kassel	0,6388 (0,0227)	214 Bremen	0,8436 (0,0180)
281 Wilhelmshaven	0,3160 (0,0420)	847 Passau	0,4999 (0,0039)	44 Halle	0,6404 (0,0214)	519 Koblenz	0,8454 (0,0155)
634 Konstanz	0,3195 (0,0271)	347 Hagen	0,5000 (0,0330)	735 Nürnberg	0,6427 (0,0246)	651 Offenburg	0,8485 (0,0224)
551 Pirmasens	0,3308 (0,0411)	411 Bad Hersfeld	0,5028 (0,0243)	535 Montabaur	0,6427 (0,0442)	43 Halberstadt	0,8542 (0,0153)
127 Heide	0,3364 (0,0220)	94 Gera	0,5052 (0,0270)	687 Villingen-Schwenningen	0,6511 (0,0351)	661 Ravensburg	0,8634 (0,0183)
419 Frankfurt	0,3394 (0,0126)	271 Uelzen	0,5067 (0,0206)	747 Schweinfurt	0,6562 (0,0356)	681 Tauberbischofsheim	0,8964 (0,0172)
325 Brühl	0,3431 (0,0325)	365 Mönchengladbach	0,5073 (0,0539)	321 Bochum	0,6566 (0,0404)	377 Rheine	0,9177 (0,0163)
539 Neunkirchen	0,3435 (0,0138)	341 Duisburg	0,5143 (0,0283)	831 Kempten	0,6632 (0,0280)	373 Paderborn	0,9297 (0,0163)
515 Kaiserslautern	0,3458 (0,0283)	723 Bayreuth	0,5145 (0,0349)	439 Korbach	0,6651 (0,0287)	98 Suhl	0,9361 (0,0218)
277 Verden	0,3521 (0,0337)	315 Bergisch Gladbach	0,5220 (0,0363)	684 Ulm	0,6652 (0,0251)	367 Münster	0,9386 (0,0283)
357 Köln	0,3537 (0,0295)	123 Hamburg	0,5235 (0,0480)	71 Annaberg-Buchholz	0,6693 (0,0288)	711 Ansbach	0,9639 (0,0233)

Table 8. Estimated quantile positions (average for 2007)

Labor agency	QP (st.error)	Labor agency	QP (st.error)	Labor agency	QP (st.error)	Labor agency	QP (st.error)
900 Berlin	0,0291 (0,0148)	327 Coesfeld	0,3548 (0,0468)	415 Darmstadt	0,5122 (0,0266)	739 Regensburg	0,6981 (0,0195)
345 Gelsenkirchen	0,0329 (0,0230)	563 Trier	0,3559 (0,0318)	217 Bremerhaven	0,5176 (0,0291)	435 Kassel	0,7007 (0,0313)
241 Helmstedt	0,0338 (0,0478)	46 Merseburg	0,3624 (0,0217)	455 Wetzlar	0,5240 (0,0258)	835 Landshut	0,7092 (0,0105)
92 Zwickau	0,0428 (0,0203)	515 Kaiserslautern	0,3673 (0,0388)	647 Nagold	0,5258 (0,0363)	657 Rastatt	0,7120 (0,0271)
637 Lörrach	0,0732 (0,0219)	38 Neuruppin	0,3699 (0,0196)	123 Hamburg	0,5287 (0,0392)	735 Nürnberg	0,7128 (0,0205)
855 Rosenheim	0,1142 (0,0242)	361 Krefeld	0,3789 (0,0448)	277 Verden	0,5334 (0,0318)	34 Stralsund	0,7205 (0,0169)
47 Sangerhausen	0,1145 (0,0153)	674 Schwäbisch Hall	0,3856 (0,0339)	831 Kempten	0,5348 (0,0267)	313 Ahlen	0,7243 (0,0301)
127 Heide	0,1377 (0,0117)	523 Ludwigshafen	0,3882 (0,0412)	627 Heilbronn	0,5353 (0,0479)	274 Vechta	0,7309 (0,0116)
827 Ingolstadt	0,1435 (0,0315)	723 Bayreuth	0,3884 (0,0306)	335 Düren	0,5402 (0,0300)	759 Würzburg	0,7324 (0,0327)
333 Dortmund	0,1451 (0,0315)	543 Landau	0,3924 (0,0265)	44 Halle	0,5501 (0,0217)	823 Freising	0,7406 (0,0111)
317 Bielefeld	0,1644 (0,0274)	551 Pirmasens	0,4023 (0,0445)	281 Wilhelmshaven	0,5510 (0,0319)	447 Marburg	0,7450 (0,0296)
71 Annaberg-Buchholz	0,1725 (0,0225)	79 Riesa	0,4072 (0,0208)	42 Dessau	0,5533 (0,0242)	539 Neunkirchen	0,7451 (0,0273)
559 Saarlouis	0,1898 (0,0371)	96 Jena	0,4108 (0,0290)	641 Ludwigsburg	0,5609 (0,0575)	341 Duisburg	0,7517 (0,0490)
131 Kiel	0,2318 (0,0161)	381 Siegen	0,4128 (0,0358)	677 Stuttgart	0,5619 (0,0270)	859 Traunstein	0,7533 (0,0048)
325 Brühl	0,2349 (0,0534)	743 Schwandorf	0,4128 (0,0152)	135 Lübeck	0,5625 (0,0160)	257 Nordhorn	0,7606 (0,0220)
391 Wuppertal	0,2358 (0,0587)	715 Aschaffenburg	0,4172 (0,0337)	45 Magdeburg	0,5647 (0,0205)	267 Stade	0,7643 (0,0247)
547 Neuwied	0,2361 (0,0225)	70 Altenburg	0,4181 (0,0186)	555 Saarbrücken	0,5660 (0,0261)	843 München	0,7723 (0,0167)
624 Heidelberg	0,2430 (0,0403)	423 Fulda	0,4222 (0,0261)	527 Mainz	0,5665 (0,0268)	97 Nordhausen	0,7780 (0,0248)
35 Cottbus	0,2531 (0,0285)	747 Schweinfurt	0,4240 (0,0295)	74 Dresden	0,5674 (0,0275)	751 Weiden	0,7782 (0,0279)
611 Aalen	0,2533 (0,0284)	247 Leer	0,4275 (0,0249)	111 Bad Oldesloe	0,5739 (0,0274)	48 Stendal	0,7839 (0,0229)
671 Waiblingen	0,2572 (0,0238)	36 Eberswalde	0,4276 (0,0236)	231 Göttingen	0,5804 (0,0380)	365 Mönchengladbach	0,7881 (0,0529)
357 Köln	0,2629 (0,0196)	631 Karlsruhe	0,4361 (0,0368)	355 Iserlohn	0,5915 (0,0283)	33 Schwerin	0,7919 (0,0167)
93 Erfurt	0,2668 (0,0282)	315 Bergisch Gladbach	0,4438 (0,0466)	411 Bad Hersfeld	0,5950 (0,0273)	617 Freiburg	0,7924 (0,0315)
443 Limburg	0,2684 (0,0280)	227 Goslar	0,4444 (0,0240)	839 Memmingen	0,5974 (0,0187)	214 Bremen	0,7928 (0,0225)
237 Hannover	0,2748 (0,0281)	264 Osnabrück	0,4510 (0,0416)	439 Korbach	0,5977 (0,0335)	684 Ulm	0,7972 (0,0243)
115 Elmshorn	0,2779 (0,0237)	72 Bautzen	0,4514 (0,0227)	459 Wiesbaden	0,5999 (0,0432)	73 Chemnitz	0,8029 (0,0310)
755 Weißenburg	0,2825 (0,0217)	78 Plauen	0,4529 (0,0469)	353 Herford	0,6099 (0,0421)	254 Nienburg	0,8081 (0,0262)
234 Hameln	0,2853 (0,0299)	139 Neumünster	0,4535 (0,0236)	261 Oldenburg	0,6190 (0,0223)	819 Donauwörth	0,8147 (0,0157)
621 Göppingen	0,2856 (0,0550)	94 Gera	0,4551 (0,0507)	76 Oschatz	0,6216 (0,0177)	535 Montabaur	0,8174 (0,0423)
815 Deggendorf	0,2875 (0,0226)	654 Pforzheim	0,4555 (0,0184)	211 Braunschweig	0,6304 (0,0218)	321 Bochum	0,8214 (0,0347)
31 Neubrandenburg	0,2878 (0,0156)	375 Recklinghausen	0,4566 (0,0472)	519 Koblenz	0,6339 (0,0240)	39 Potsdam	0,8315 (0,0228)
451 Offenbach	0,2899 (0,0300)	427 Gießen	0,4578 (0,0180)	644 Mannheim	0,6446 (0,0280)	95 Gotha	0,8411 (0,0171)
251 Lüneburg	0,2924 (0,0293)	811 Augsburg	0,4586 (0,0218)	98 Suhl	0,6521 (0,0471)	511 Bad Kreuznach	0,8417 (0,0256)
244 Hildesheim	0,2925 (0,0265)	32 Rostock	0,4608 (0,0245)	664 Reutlingen	0,6529 (0,0289)	681 Tauberbischofsheim	0,8447 (0,0198)
687 Villingen-Schwenningen	0,2979 (0,0509)	431 Hanau	0,4609 (0,0178)	77 Pirna	0,6554 (0,0283)	661 Ravensburg	0,8543 (0,0243)
385 Solingen	0,3030 (0,0414)	383 Soest	0,4639 (0,0234)	371 Oberhausen	0,6605 (0,0345)	337 Düsseldorf	0,8571 (0,0200)
614 Balingen	0,3126 (0,0269)	531 Mayen	0,4773 (0,0161)	271 Uelzen	0,6618 (0,0228)	37 Frankfurt (Oder)	0,8652 (0,0143)
221 Celle	0,3178 (0,0250)	347 Hagen	0,4801 (0,0509)	363 Meschede	0,6659 (0,0215)	377 Rheine	0,8735 (0,0278)
351 Hamm	0,3183 (0,0363)	387 Wesel	0,4937 (0,0214)	311 Aachen	0,6675 (0,0289)	667 Rottweil	0,8839 (0,0284)
343 Essen	0,3208 (0,0345)	49 Wittenberg	0,4996 (0,0226)	373 Paderborn	0,6767 (0,0516)	651 Offenburg	0,8945 (0,0137)
727 Coburg	0,3229 (0,0257)	75 Leipzig	0,5010 (0,0720)	119 Flensburg	0,6777 (0,0092)	367 Münster	0,9724 (0,0270)
634 Konstanz	0,3283 (0,0234)	419 Frankfurt	0,5013 (0,0202)	331 Detmold	0,6800 (0,0327)	711 Ansbach	0,9766 (0,0184)
323 Bonn	0,3315 (0,0286)	43 Halberstadt	0,5021 (0,0237)	847 Passau	0,6865 (0,0096)	224 Emden	0,9819 (0,0357)
719 Bamberg	0,3350 (0,0208)	731 Hof	0,5079 (0,0371)	851 Pfarrkirchen	0,6869 (0,0130)	863 Weilheim	0,9835 (0,0189)

Table 9. Estimated quantile positions (average for 2008)

Labor agency	QP (st.error)	Labor agency	QP (st.error)	Labor agency	QP (st.error)	Labor agency	QP (st.error)
92 Zwickau	0,0034 (0,0118)	70 Altenburg	0,3471 (0,0204)	227 Goslar	0,5089 (0,0409)	363 Meschede	0,7122 (0,0276)
637 Lörrach	0,0179 (0,0083)	264 Osnabrück	0,3483 (0,0333)	36 Eberswalde	0,5089 (0,0323)	79 Riesa	0,7179 (0,0194)
47 Sangerhausen	0,0696 (0,0095)	527 Mainz	0,3487 (0,0362)	333 Dortmund	0,5099 (0,0403)	823 Freising	0,7200 (0,0193)
644 Mannheim	0,1127 (0,0286)	271 Uelzen	0,3563 (0,0188)	371 Oberhausen	0,5104 (0,0357)	73 Chemnitz	0,7201 (0,0432)
559 Saarlouis	0,1328 (0,0246)	76 Oschatz	0,3599 (0,0279)	224 Emden	0,5114 (0,0069)	863 Weilheim	0,7208 (0,0204)
343 Essen	0,1442 (0,0445)	72 Bautzen	0,3612 (0,0207)	43 Halberstadt	0,5140 (0,0212)	331 Detmold	0,7215 (0,0325)
391 Wuppertal	0,1565 (0,0526)	614 Balingen	0,3666 (0,0270)	535 Montabaur	0,5173 (0,0431)	267 Stade	0,7230 (0,0242)
345 Gelsenkirchen	0,1614 (0,0346)	237 Hannover	0,3667 (0,0288)	723 Bayreuth	0,5288 (0,0307)	531 Mayen	0,7332 (0,0258)
123 Hamburg	0,1630 (0,0380)	855 Rosenheim	0,3773 (0,0214)	49 Wittenberg	0,5378 (0,0329)	375 Recklinghausen	0,7346 (0,0596)
355 Iserlohn	0,1744 (0,0257)	835 Landshut	0,3843 (0,0230)	365 Mönchengladbach	0,5554 (0,0733)	447 Marburg	0,7347 (0,0155)
35 Cottbus	0,1833 (0,0245)	381 Siegen	0,3880 (0,0385)	831 Kempten	0,5578 (0,0209)	311 Aachen	0,7357 (0,0266)
677 Stuttgart	0,1860 (0,0210)	74 Dresden	0,3882 (0,0170)	634 Konstanz	0,5599 (0,0237)	657 Rastatt	0,7379 (0,0249)
385 Solingen	0,1991 (0,0537)	241 Helmstedt	0,3942 (0,0429)	671 Waiblingen	0,5639 (0,0367)	34 Stralsund	0,7409 (0,0171)
247 Leer	0,2049 (0,0204)	727 Coburg	0,3957 (0,0366)	431 Hanau	0,5642 (0,0220)	847 Passau	0,7418 (0,0018)
621 Göppingen	0,2097 (0,0353)	96 Jena	0,3985 (0,0316)	815 Deggendorf	0,5668 (0,0129)	851 Pfarrkirchen	0,7429 (0,0077)
547 Neuwied	0,2098 (0,0187)	323 Bonn	0,4112 (0,0208)	217 Bremerhaven	0,5675 (0,0288)	859 Traunstein	0,7441 (0,0066)
357 Köln	0,2110 (0,0212)	811 Augsburg	0,4204 (0,0189)	335 Düren	0,5678 (0,0307)	94 Gera	0,7453 (0,0290)
900 Berlin	0,2112 (0,0135)	231 Göttingen	0,4224 (0,0293)	111 Bad Oldesloe	0,5696 (0,0296)	33 Schwerin	0,7471 (0,0204)
654 Pforzheim	0,2361 (0,0238)	451 Offenbach	0,4370 (0,0351)	127 Heide	0,5722 (0,0155)	257 Nordhorn	0,7570 (0,0235)
611 Aalen	0,2420 (0,0211)	361 Krefeld	0,4385 (0,0533)	97 Nordhausen	0,5813 (0,0374)	45 Magdeburg	0,7659 (0,0255)
317 Bielefeld	0,2436 (0,0288)	95 Gotha	0,4438 (0,0371)	37 Frankfurt (Oder)	0,5842 (0,0232)	617 Freiburg	0,7897 (0,0268)
251 Lüneburg	0,2524 (0,0323)	93 Erfurt	0,4453 (0,0301)	563 Trier	0,5855 (0,0384)	631 Karlsruhe	0,7986 (0,0288)
387 Wesel	0,2590 (0,0181)	751 Weiden	0,4461 (0,0237)	419 Frankfurt	0,5896 (0,0317)	759 Würzburg	0,8044 (0,0244)
38 Neuruppin	0,2620 (0,0207)	641 Ludwigsburg	0,4497 (0,0545)	281 Wilhelmshaven	0,5900 (0,0300)	214 Bremen	0,8066 (0,0283)
315 Bergisch Gladbach	0,2704 (0,0550)	523 Ludwigshafen	0,4509 (0,0482)	427 Gießen	0,5974 (0,0272)	435 Kassel	0,8198 (0,0257)
46 Merseburg	0,2735 (0,0197)	667 Rottweil	0,4514 (0,0413)	119 Flensburg	0,5997 (0,0159)	455 Wetzlar	0,8324 (0,0235)
351 Hamm	0,2736 (0,0360)	715 Aschaffenburg	0,4537 (0,0281)	277 Verden	0,6033 (0,0271)	519 Koblenz	0,8330 (0,0232)
244 Hildesheim	0,2806 (0,0300)	42 Dessau	0,4570 (0,0266)	735 Nürnberg	0,6034 (0,0305)	337 Düsseldorf	0,8364 (0,0177)
555 Saarbrücken	0,2887 (0,0285)	747 Schweinfurt	0,4591 (0,0330)	373 Paderborn	0,6110 (0,0318)	98 Suhl	0,8390 (0,0270)
739 Regensburg	0,2891 (0,0117)	731 Hof	0,4598 (0,0328)	341 Duisburg	0,6116 (0,0449)	377 Rheine	0,8486 (0,0352)
839 Memmingen	0,2897 (0,0228)	139 Neumünster	0,4606 (0,0241)	135 Lübeck	0,6133 (0,0158)	827 Ingolstadt	0,8496 (0,0260)
511 Bad Kreuznach	0,2951 (0,0299)	687 Villingen-Schwenningen	0,4657 (0,0310)	681 Tauberbischofsheim	0,6170 (0,0238)	313 Ahlen	0,8562 (0,0248)
551 Pirmasens	0,3019 (0,0320)	31 Neubrandenburg	0,4673 (0,0203)	411 Bad Hersfeld	0,6377 (0,0253)	843 München	0,8622 (0,0283)
75 Leipzig	0,3041 (0,0680)	515 Kaiserslautern	0,4714 (0,0333)	423 Fulda	0,6378 (0,0232)	274 Vechta	0,8672 (0,0106)
755 Weißenburg	0,3095 (0,0245)	44 Halle	0,4735 (0,0229)	115 Elmshorn	0,6569 (0,0222)	539 Neunkirchen	0,8770 (0,0206)
77 Pirna	0,3110 (0,0210)	684 Ulm	0,4757 (0,0423)	543 Landau	0,6672 (0,0221)	674 Schwäbisch Hall	0,8868 (0,0438)
71 Annaberg-Buchholz	0,3138 (0,0341)	443 Limburg	0,4782 (0,0213)	719 Bamberg	0,6724 (0,0187)	651 Offenburg	0,8871 (0,0182)
647 Nagold	0,3143 (0,0337)	221 Celle	0,4793 (0,0247)	261 Oldenburg	0,6753 (0,0245)	48 Stendal	0,8920 (0,0187)
383 Soest	0,3151 (0,0239)	624 Heidelberg	0,4882 (0,0674)	32 Rostock	0,6759 (0,0297)	367 Münster	0,9026 (0,0216)
131 Kiel	0,3202 (0,0167)	743 Schwandorf	0,4886 (0,0166)	439 Korbach	0,6801 (0,0224)	321 Bochum	0,9077 (0,0383)
234 Hameln	0,3261 (0,0442)	353 Herford	0,4890 (0,0447)	211 Braunschweig	0,6836 (0,0201)	415 Darmstadt	0,9097 (0,0233)
325 Brühl	0,3276 (0,0625)	627 Heilbronn	0,4954 (0,0387)	819 Donauwörth	0,6889 (0,0075)	711 Ansbach	0,9154 (0,0163)
327 Coesfeld	0,3295 (0,0636)	664 Reutlingen	0,5016 (0,0329)	39 Potsdam	0,6932 (0,0278)	459 Wiesbaden	0,9238 (0,0353)
78 Plauen	0,3349 (0,0357)	254 Nienburg	0,5057 (0,0193)	347 Hagen	0,7051 (0,0456)	661 Ravensburg	0,9923 (0,0070)

Table 10. Matching quality of explanatory variables (standardized differences (2006–2008))

Variable	Mean	Median	St.dev	Min	90% Qnt	Max
East-West dummy	0.0143	0.0000	0.0765	0.0000	0.0096	0.6652
Unemployment rate	0.1907	0.1493	0.1390	0.0270	0.3932	0.7944
Share of registered unemployed (SGB III) by age						
15–24 years old	0.4432	0.4102	0.2230	0.0950	0.7200	1.3659
25–54 years old[a)]	0.4941	0.4268	0.2798	0.1259	0.8820	1.9339
55–64 years old[b)]	0.4476	0.3857	0.2664	0.1195	0.7782	1.9851
Share of registered female unemployed (SGB III)	0.4742	0.4095	0.2624	0.1211	0.8190	1.4858
Share of female employed[c)]	0.4227	0.3421	0.3218	0.0314	0.8368	1.8137
Share of employees by education						
Elementary and secondary school (w/o VT)[d)]	0.3295	0.2681	0.2686	0.0283	0.7040	1.7022
High school without VT[e)]	0.3726	0.2661	0.3619	0.0263	0.8230	1.9400
Elementary and secondary school (with VT)[f)]	0.3558	0.2551	0.2923	0.0340	0.7147	1.8464
High school with VT[g)]	0.3085	0.2285	0.2795	0.0162	0.6409	1.8259
Technical college[h)]	0.4388	0.3672	0.3536	0.0328	0.8393	2.3173
University[i)]	0.3972	0.2984	0.3823	0.0389	0.7361	3.0654
Education unknown[j)]	0.4656	0.3586	0.3977	0.0440	1.0226	2.5278
Shares of employees by sectors (NACE 2003)						
Agriculture, hunting and forestry[k)]	0.3382	0.2279	0.3384	0.0196	0.7852	1.9180
Fishing[l)]	0.2622	0.1062	0.5877	0.0039	0.4414	5.5727
Mining and quarrying[m)]	0.4911	0.2769	0.7711	0.0086	0.2107	6.5713
Manufacturing[n)]	0.4560	0.3904	0.3437	0.0437	0.8546	1.9727
Electricity, gas and water supply[o)]	0.6072	0.4514	0.5444	0.0317	1.2800	3.1355
Construction[p)]	0.3775	0.2717	0.3055	0.0444	0.8198	1.8578
Wholesale and retail trade[q)]	0.6252	0.4797	0.4866	0.0354	1.2539	2.4175
Hotels and restaurants[r)]	0.4743	0.3080	0.5626	0.0374	1.1441	4.7307
Transport, storage and communication[s)]	0.5634	0.4298	0.7497	0.0456	1.0267	8.3847
Financial intermediation[t)]	0.4098	0.2413	0.5280	0.0178	0.9680	3.4483
Real estate, renting and business activity[u)]	0.4702	0.4038	0.3315	0.0496	0.8853	1.9199
Public administration and defense[v)]	0.5178	0.3950	0.4862	0.0377	1.0335	3.9215
Education[w)]	0.4739	0.3515	0.3970	0.0236	0.9760	2.5127
Health and social work[x)]	0.6070	0.5637	0.4475	0.0522	1.1429	2.8084
Other community and service activities[y)]	0.5447	0.4045	0.5111	0.0424	1.0775	3.8378
Private households with employed persons[z)]	0.4157	0.3156	0.3259	0.0409	0.8244	2.0945
Others[aa)]	0.3744	0.1813	0.8996	0.0238	0.8236	10.6131
Flow into unemployment (Share; Employed)	0.2225	0.1712	0.1565	0.0412	0.4128	1.0978
Non-subsidized vacancies (Share; UN SGB III)[ab)]	0.3612	0.2839	0.2727	0.0638	0.6788	2.0364
Average wages (in logarithm)	0.1716	0.1376	0.1249	0.0251	0.3271	0.8552
Seasonal span of unemployment	0.1972	0.1649	0.1257	0.0252	0.3635	0.7508
Density of population (in logarithm)[ac)]	0.3114	0.2468	0.2660	0.0191	0.5848	2.0896

Notes: Regions with mismatch in [a)]Brühl, Ludwigshafen; [b)]Brühl; [c)]Helmstedt; [d)]Iserlohn [e)]Aachen, Marburg, Münster, Freising; [f)]Berlin; [g)]Münster; [h)]Stuttgart, Pirna, Dresden; [i)]Heidelberg, Jena, Dresden; [j)]München, Freising, Berlin; [k)]Vechta, Stendal; [l)]Heide, Bremerhaven, Stade, Stralsund, Neubrandenburg, Frankfurt (Oder); [m)]Cottbus, Nienburg, Rheine, Wesel, Oberhausen, Gelsenkirchen, Bochum, Dortmund, Bad Hersfeld, Saarlouis; [n)]Helmstedt, Iserlohn, Freising; [o)]Flensburg, Elmshorn, Emden, Cottbus, Essen, Mönchengladbach, Nürnberg, Karlsruhe; [p)]Pfarrkirchen; [r)]Verden, Helmstedt, Oberhausen, Mönchengladbach, Brühl, Düren, Limburg, Ludwigshaven, Heidelberg; [s)]Stralsund, Rostock, Halberstadt, Goslar, Nagold, Freising, Kempten; [t)]Bremerhaven, Bremen, Hamm, Duisburg, Frankfurt, Freising; [u)]Münster, Dortmund, Köln, Koblenz, Wiesbaden, Frankfurt, Coburg; [v)]Essen [w)]Kiel, Wilhelmshaven, Leipzig, Koblenz, Wiesbaden; [x)]Neubrandenburg, Neuruppin, Marburg; [y)]Elmshorn, Korbach, Aschaffenburg, Neunkirchen, Heidelberg, Freiburg; [z)]Kiel, Düsseldorf, Köln, Bonn, Mainz, Rastatt [aa)]München, Rosenheim; [ab)]Weiden, Kaiserslautern, Neunkirchen, Pirmasens; [ac)]Berlin.

Table 11. Absolute performance and quantile positions

Labor agency	Absolute performance 2006	Absolute performance 2007	Absolute performance 2008	Quantile position 2006	Quantile position 2007	Quantile position 2008
31 Neubrandenburg	0,0089	-0,0041	0,0040	0,4659	0,2878	0,4673
32 Rostock	-0,0001	0,0001	0,0058	0,5992	0,4608	0,6759
33 Schwerin	0,0069	0,0071	0,0080	0,7055	0,7919	0,7471
34 Stralsund	0,0227	0,0272	0,0328	0,6930	0,7205	0,7409
35 Cottbus	-0,0055	-0,0047	-0,0045	0,1103	0,2531	0,1833
36 Eberswalde	-0,0069	-0,0032	0,0004	0,2121	0,4276	0,5089
37 Frankfurt (Oder)	0,0013	0,0118	0,0012	0,4741	0,8652	0,5842
38 Neuruppin	-0,0055	-0,0026	-0,0048	0,3850	0,3699	0,2620
39 Potsdam	0,0122	0,0045	0,0040	0,8276	0,8315	0,6932
42 Dessau	-0,0085	-0,0007	-0,0003	0,2811	0,5533	0,4570
43 Halberstadt	0,0153	0,0021	0,0032	0,8542	0,5021	0,5140
44 Halle	-0,0051	0,0003	-0,0011	0,6404	0,5501	0,4735
45 Magdeburg	0,0010	0,0036	0,0094	0,5872	0,5647	0,7659
46 Merseburg	0,0017	-0,0050	-0,0097	0,6208	0,3624	0,2735
47 Sangerhausen	-0,0161	-0,0147	-0,0153	0,0332	0,1145	0,0696
48 Stendal	0,0162	0,0065	0,0138	0,7586	0,7839	0,8920
49 Wittenberg	0,0043	0,0002	0,0022	0,5905	0,4996	0,5378
70 Altenburg	0,0001	-0,0023	-0,0059	0,3746	0,4181	0,3471
71 Annaberg-Buchholz	0,0035	-0,0066	-0,0018	0,6693	0,1725	0,3138
72 Bautzen	-0,0049	0,0004	-0,0050	0,3585	0,4514	0,3612
73 Chemnitz	0,0066	0,0141	0,0126	0,7235	0,8029	0,7201
74 Dresden	-0,0097	0,0031	-0,0043	0,4210	0,5674	0,3882
75 Leipzig	-0,0061	-0,0010	-0,0021	0,3922	0,5010	0,3041
76 Oschatz	0,0029	0,0024	-0,0020	0,4846	0,6216	0,3599
77 Pirna	0,0111	0,0062	0,0006	0,5503	0,6554	0,3110
78 Plauen	-0,0023	0,0019	0,0001	0,2828	0,4529	0,3349
79 Riesa	-0,0093	-0,0026	0,0051	0,4259	0,4072	0,7179
92 Zwickau	-0,0074	-0,0141	-0,0126	0,0539	0,0428	0,0034
93 Erfurt	-0,0052	-0,0074	-0,0045	0,2599	0,2668	0,4453
94 Gera	0,0048	-0,0019	0,0112	0,5052	0,4551	0,7453
95 Gotha	-0,0042	0,0097	-0,0062	0,5742	0,8411	0,4438
96 Jena	0,0020	0,0004	-0,0016	0,6298	0,4108	0,3985
97 Nordhausen	0,0086	0,0114	0,0017	0,5706	0,7780	0,5813
98 Suhl	0,0152	0,0105	0,0072	0,9361	0,6521	0,8390
111 Bad Oldesloe	-0,0009	0,0021	0,0018	0,4122	0,5739	0,5696
115 Elmshorn	-0,0015	-0,0040	0,0016	0,4710	0,2779	0,6569
119 Flensburg	0,0208	0,0194	0,0122	0,7784	0,6777	0,5997
123 Hamburg	-0,0014	-0,0003	-0,0070	0,5235	0,5287	0,1630
127 Heide	-0,0061	-0,0147	0,0135	0,3364	0,1377	0,5722
131 Kiel	-0,0082	-0,0062	-0,0048	0,2522	0,2318	0,3202
135 Lübeck	0,0140	0,0129	0,0163	0,6272	0,5625	0,6133
139 Neumünster	0,0030	-0,0008	-0,0037	0,6823	0,4535	0,4606
211 Braunschweig	-0,0022	0,0047	0,0072	0,4520	0,6304	0,6836
214 Bremen	0,0076	0,0121	0,0068	0,8436	0,7928	0,8066

(continued)

Table 11. Absolute performance and quantile positions (continued)

	Absolute performance			Quantile position		
Labor agency	2006	2007	2008	2006	2007	2008
217 Bremerhaven	-0,0189	-0,0033	-0,0082	0,3002	0,5176	0,5675
221 Celle	-0,0028	-0,0056	-0,0003	0,3614	0,3178	0,4793
224 Emden	0,0134	0,0124	0,0224	0,7158	0,9819	0,5114
227 Goslar	0,0028	-0,0060	0,0037	0,7330	0,4444	0,5089
231 Göttingen	-0,0027	0,0020	-0,0003	0,4409	0,5804	0,4224
234 Hameln	-0,0063	-0,0046	-0,0019	0,2735	0,2853	0,3261
237 Hannover	-0,0044	-0,0093	-0,0036	0,2111	0,2748	0,3667
241 Helmstedt	-0,0080	-0,0112	-0,0054	0,2118	0,0338	0,3942
244 Hildesheim	-0,0052	-0,0060	-0,0068	0,3608	0,2925	0,2806
247 Leer	-0,0176	-0,0026	-0,0149	0,3882	0,4275	0,2049
251 Lüneburg	-0,0106	-0,0051	-0,0069	0,1732	0,2924	0,2524
254 Nienburg	0,0070	0,0153	0,0080	0,6981	0,8081	0,5057
257 Nordhorn	0,0159	0,0197	0,0187	0,6824	0,7606	0,7570
261 Oldenburg	0,0001	0,0065	0,0089	0,5360	0,6190	0,6753
264 Osnabrück	-0,0020	-0,0029	-0,0048	0,4569	0,4510	0,3483
267 Stade	0,0125	0,0145	0,0098	0,7127	0,7643	0,7230
271 Uelzen	0,0094	0,0069	0,0009	0,5067	0,6618	0,3563
274 Vechta	0,0176	0,0107	0,0126	0,7327	0,7309	0,8672
277 Verden	-0,0020	-0,0004	0,0027	0,3521	0,5334	0,6033
281 Wilhelmshaven	-0,0019	0,0047	0,0101	0,3160	0,5510	0,5900
311 Aachen	0,0069	0,0075	0,0087	0,6194	0,6675	0,7357
313 Ahlen	0,0014	0,0070	0,0175	0,6050	0,7243	0,8562
315 Bergisch Gladbach	0,0019	-0,0013	-0,0057	0,5220	0,4438	0,2704
317 Bielefeld	-0,0064	-0,0129	-0,0123	0,3790	0,1644	0,2436
321 Bochum	0,0019	0,0253	0,0153	0,6566	0,8214	0,9077
323 Bonn	-0,0013	-0,0033	-0,0030	0,4745	0,3315	0,4112
325 Brühl	-0,0025	-0,0043	-0,0035	0,3431	0,2349	0,3276
327 Coesfeld	-0,0066	-0,0067	-0,0052	0,4576	0,3548	0,3295
331 Detmold	0,0095	0,0076	0,0044	0,7133	0,6800	0,7215
333 Dortmund	-0,0038	-0,0065	0,0011	0,2285	0,1451	0,5099
335 Düren	0,0037	0,0025	0,0020	0,6301	0,5402	0,5678
337 Düsseldorf	0,0019	0,0057	0,0120	0,7109	0,8571	0,8364
341 Duisburg	0,0018	0,0036	0,0036	0,5143	0,7517	0,6116
343 Essen	0,0033	-0,0046	-0,0102	0,7238	0,3208	0,1442
345 Gelsenkirchen	-0,0014	-0,0068	-0,0035	0,1789	0,0329	0,1614
347 Hagen	0,0001	0,0012	0,0053	0,5000	0,4801	0,7051
351 Hamm	-0,0032	-0,0014	-0,0089	0,3705	0,3183	0,2736
353 Herford	-0,0004	0,0037	0,0015	0,5304	0,6099	0,4890
355 Iserlohn	0,0012	0,0023	-0,0145	0,5321	0,5915	0,1744
357 Köln	-0,0019	-0,0032	-0,0117	0,3537	0,2629	0,2110
361 Krefeld	-0,0031	-0,0029	-0,0028	0,1900	0,3789	0,4385
363 Meschede	0,0148	0,0103	0,0089	0,5437	0,6659	0,7122
365 Mönchengladbach	-0,0002	0,0052	0,0028	0,5073	0,7881	0,5554
367 Münster	0,0144	0,0169	0,0140	0,9386	0,9724	0,9026

(continued)

Table 11. Absolute performance and quantile positions (continued)

Labor agency	Absolute performance 2006	2007	2008	Quantile position 2006	2007	2008
371 Oberhausen	-0,0020	0,0038	0,0009	0,3745	0,6605	0,5104
373 Paderborn	0,0180	0,0079	0,0064	0,9297	0,6767	0,6110
375 Recklinghausen	0,0008	-0,0022	0,0035	0,5630	0,4566	0,7346
377 Rheine	0,0160	0,0108	0,0114	0,9177	0,8735	0,8486
381 Siegen	0,0038	-0,0022	-0,0038	0,7263	0,4128	0,3880
383 Soest	0,0030	-0,0023	-0,0093	0,4770	0,4639	0,3151
385 Solingen	-0,0002	-0,0022	-0,0081	0,4705	0,3030	0,1991
387 Wesel	-0,0124	-0,0007	-0,0139	0,2962	0,4937	0,2590
391 Wuppertal	-0,0052	-0,0043	-0,0116	0,1304	0,2358	0,1565
411 Bad Hersfeld	-0,0075	0,0002	0,0075	0,5028	0,5950	0,6377
415 Darmstadt	-0,0067	-0,0038	0,0101	0,1822	0,5122	0,9097
419 Frankfurt	-0,0055	0,0036	0,0021	0,3394	0,5013	0,5896
423 Fulda	0,0083	0,0030	0,0071	0,6088	0,4222	0,6378
427 Gießen	0,0029	0,0021	0,0042	0,6013	0,4578	0,5974
431 Hanau	-0,0087	-0,0021	0,0024	0,3122	0,4609	0,5642
435 Kassel	0,0098	0,0089	0,0120	0,6388	0,7007	0,8198
439 Korbach	0,0132	0,0072	0,0045	0,6651	0,5977	0,6801
443 Limburg	-0,0104	-0,0051	0,0040	0,3559	0,2684	0,4782
447 Marburg	-0,0035	0,0128	0,0117	0,5950	0,7450	0,7347
451 Offenbach	0,0013	-0,0033	-0,0036	0,4914	0,2899	0,4370
455 Wetzlar	0,0027	0,0043	0,0127	0,5670	0,5240	0,8324
459 Wiesbaden	-0,0039	0,0007	0,0105	0,3080	0,5999	0,9238
511 Bad Kreuznach	0,0127	0,0119	-0,0001	0,7693	0,8417	0,2951
515 Kaiserslautern	-0,0067	-0,0061	-0,0020	0,3458	0,3673	0,4714
519 Koblenz	0,0208	0,0154	0,0222	0,8454	0,6339	0,8330
523 Ludwigshafen	0,0027	-0,0047	-0,0019	0,5982	0,3882	0,4509
527 Mainz	0,0056	0,0018	-0,0028	0,7388	0,5665	0,3487
531 Mayen	0,0087	0,0045	0,0149	0,5788	0,4773	0,7332
535 Montabaur	0,0105	0,0113	-0,0014	0,6427	0,8174	0,5173
539 Neunkirchen	0,0039	0,0110	0,0143	0,3435	0,7451	0,8770
543 Landau	-0,0060	-0,0016	0,0036	0,3735	0,3924	0,6672
547 Neuwied	0,0009	-0,0069	-0,0079	0,5524	0,2361	0,2098
551 Pirmasens	0,0004	0,0008	-0,0025	0,3308	0,4023	0,3019
555 Saarbrücken	0,0061	0,0019	-0,0079	0,7679	0,5660	0,2887
559 Saarlouis	0,0009	-0,0119	-0,0145	0,4742	0,1898	0,1328
563 Trier	0,0128	-0,0026	0,0021	0,7040	0,3559	0,5855
611 Aalen	-0,0026	-0,0076	-0,0011	0,1744	0,2533	0,2420
614 Balingen	-0,0077	-0,0093	-0,0063	0,2084	0,3126	0,3666
617 Freiburg	0,0029	0,0154	0,0141	0,6817	0,7924	0,7897
621 Göppingen	-0,0048	-0,0039	-0,0121	0,2324	0,2856	0,2097
624 Heidelberg	0,0018	-0,0051	-0,0016	0,5984	0,2430	0,4882
627 Heilbronn	0,0035	0,0022	0,0032	0,6263	0,5353	0,4954
631 Karlsruhe	0,0063	0,0003	0,0079	0,8340	0,4361	0,7986
634 Konstanz	-0,0042	-0,0053	0,0049	0,3195	0,3283	0,5599

(continued)

Table 11. Absolute performance and quantile positions (continued)

	Absolute performance			Quantile position		
Labor agency	2006	2007	2008	2006	2007	2008
637 Lörrach	-0,0161	-0,0219	-0,0244	0,1135	0,0732	0,0179
641 Ludwigsburg	0,0047	0,0024	0,0008	0,6076	0,5609	0,4497
644 Mannheim	-0,0065	0,0061	-0,0092	0,2383	0,6446	0,1127
647 Nagold	0,0037	0,0068	-0,0049	0,5874	0,5258	0,3143
651 Offenburg	0,0147	0,0307	0,0246	0,8485	0,8945	0,8871
654 Pforzheim	-0,0111	-0,0032	-0,0060	0,1992	0,4555	0,2361
657 Rastatt	0,0084	0,0104	0,0148	0,7038	0,7120	0,7379
661 Ravensburg	0,0208	0,0132	0,0243	0,8634	0,8543	0,9923
664 Reutlingen	0,0021	0,0018	-0,0025	0,5497	0,6529	0,5016
667 Rottweil	0,0106	0,0136	-0,0016	0,6943	0,8839	0,4514
671 Waiblingen	-0,0020	-0,0055	-0,0009	0,4288	0,2572	0,5639
674 Schwäbisch Hall	0,0125	-0,0026	0,0146	0,7122	0,3856	0,8868
677 Stuttgart	-0,0009	-0,0008	-0,0103	0,3681	0,5619	0,1860
681 Tauberbischofsheim	0,0175	0,0180	0,0124	0,8964	0,8447	0,6170
684 Ulm	0,0087	0,0224	0,0010	0,6652	0,7972	0,4757
687 Villingen-Schwenningen	0,0071	-0,0113	0,0008	0,6511	0,2979	0,4657
711 Ansbach	0,0284	0,0233	0,0258	0,9639	0,9766	0,9154
715 Aschaffenburg	0,0019	-0,0110	-0,0034	0,4878	0,4172	0,4537
719 Bamberg	-0,0069	-0,0079	0,0131	0,3114	0,3350	0,6724
723 Bayreuth	-0,0109	0,0026	0,0053	0,5145	0,3884	0,5288
727 Coburg	-0,0059	-0,0051	-0,0098	0,4566	0,3229	0,3957
731 Hof	0,0030	0,0005	-0,0073	0,2115	0,5079	0,4598
735 Nürnberg	0,0101	0,0083	0,0052	0,6427	0,7128	0,6034
739 Regensburg	0,0033	0,0027	-0,0063	0,6244	0,6981	0,2891
743 Schwandorf	-0,0006	0,0044	0,0107	0,3562	0,4128	0,4886
747 Schweinfurt	0,0041	-0,0037	-0,0006	0,6562	0,4240	0,4591
751 Weiden	0,0107	0,0205	0,0039	0,5276	0,7782	0,4461
755 Weißenburg	-0,0284	-0,0093	-0,0175	0,2132	0,2825	0,3095
759 Würzburg	0,0074	0,0131	0,0115	0,6838	0,7324	0,8044
811 Augsburg	0,0023	-0,0011	-0,0087	0,2995	0,4586	0,4204
815 Deggendorf	-0,0030	-0,0095	0,0073	0,6003	0,2875	0,5668
819 Donauwörth	0,0072	0,0112	0,0075	0,7011	0,8147	0,6889
823 Freising	0,0022	0,0105	0,0088	0,7632	0,7406	0,7200
827 Ingolstadt	-0,0033	-0,0027	0,0068	0,3655	0,1435	0,8496
831 Kempten	-0,0068	0,0011	0,0038	0,6632	0,5348	0,5578
835 Landshut	0,0116	0,0079	-0,0035	0,6905	0,7092	0,3843
839 Memmingen	-0,0057	-0,0003	-0,0100	0,3132	0,5974	0,2897
843 München	0,0076	0,0076	0,0082	0,6112	0,7723	0,8622
847 Passau	0,0030	0,0095	0,0139	0,4999	0,6865	0,7418
851 Pfarrkirchen	0,0218	0,0118	0,0122	0,6778	0,6869	0,7429
855 Rosenheim	-0,0100	-0,0073	-0,0047	0,2586	0,1142	0,3773
859 Traunstein	0,0086	0,0074	0,0088	0,7551	0,7533	0,7441
863 Weilheim	0,0100	0,0073	0,0042	0,6774	0,9835	0,7208
900 Berlin	-0,0130	-0,0151	-0,0091	0,1001	0,0291	0,2112

Appendix B
Figures

Figure 1. Convexity of cross validation function

Geographical distance

Statistical distance

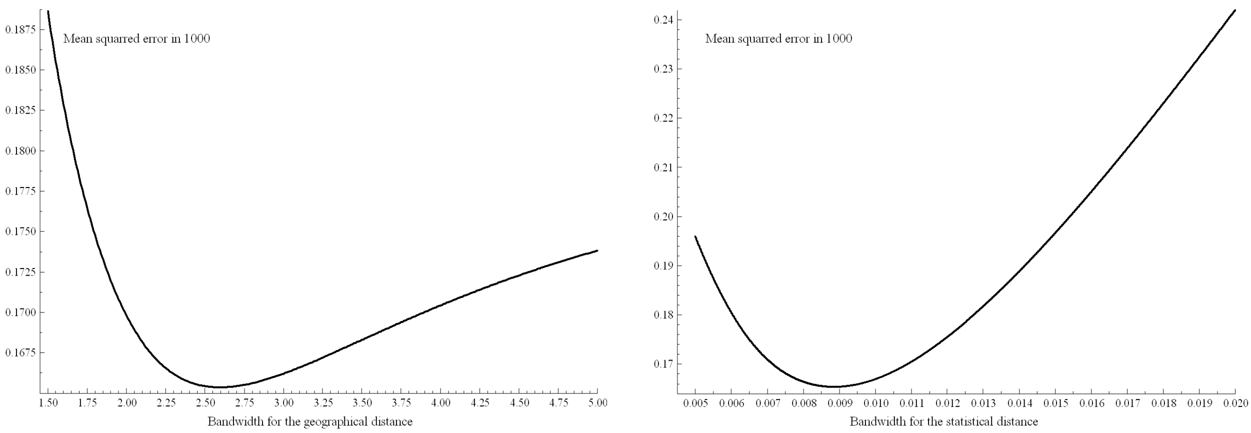


Figure 3. Sum of absolute weights (2006–2008)

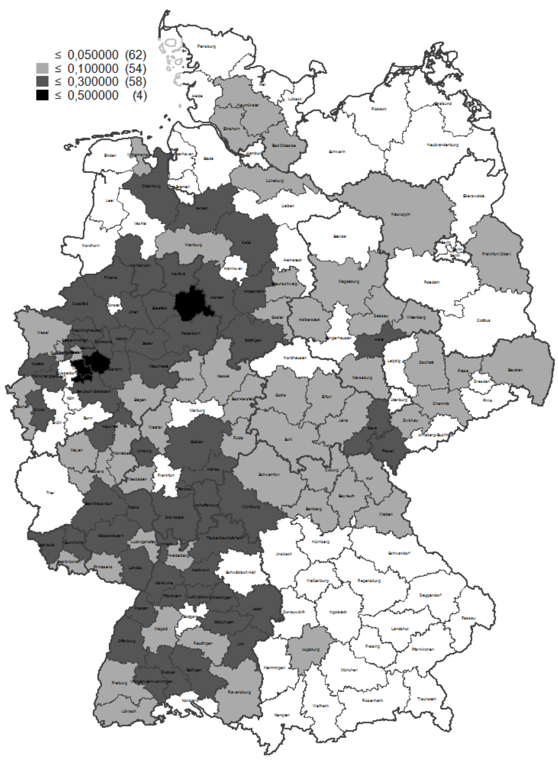
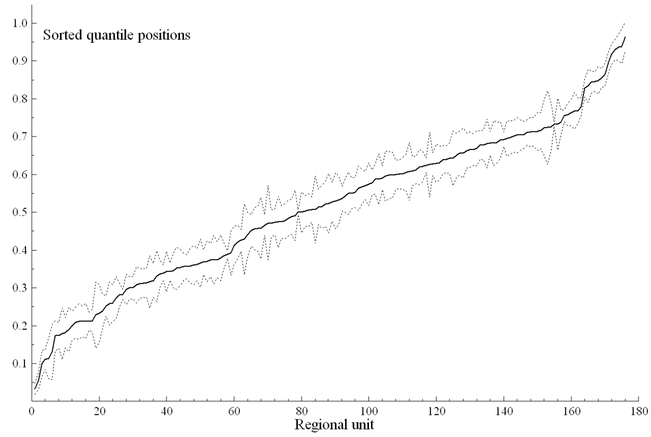
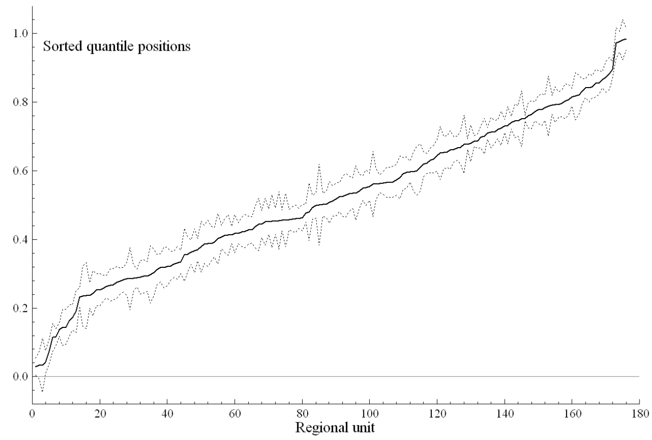


Figure 4. Estimated quantile positions and 90% confidence intervals

2006



2007



2008

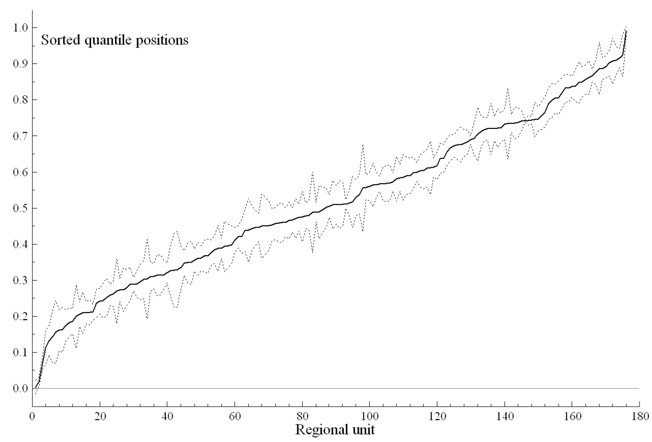


Figure 5. Spatial distribution of estimated quantile positions

2006 2007 2008

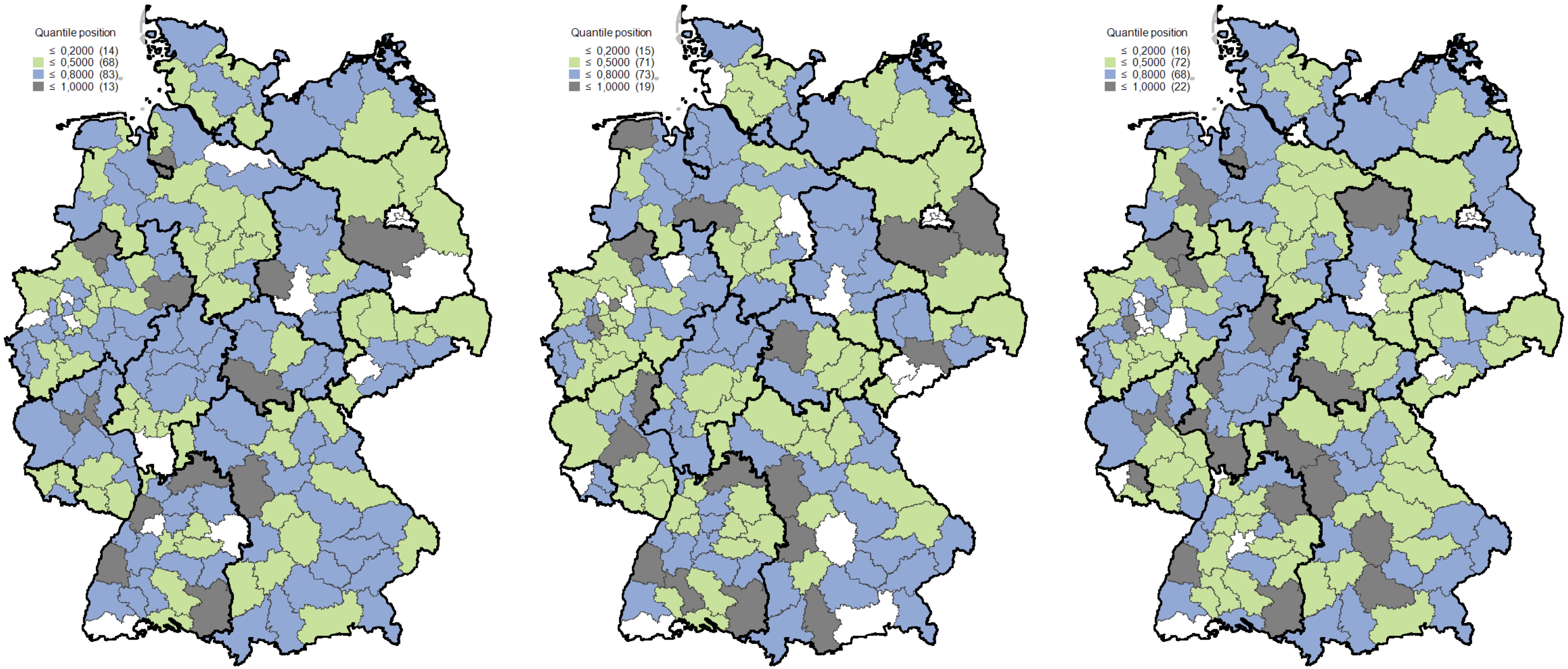


Figure 6. Spatial distribution of absolute performance (deviation from median in estimated integration rate)

2006 | 2007 | 2008