Performance Measurement and Determinants of Inefficiency of Regional Employment Offices: A Non-parametric Frontier Analysis for Switzerland

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Abstract

Since 1996, the Swiss federal authorities have shifted their unemployment policy from a "passive" income maintenance programme to active labour market measures aiming at a faster reintegration of the unemployed into the labour market. Simultaneously, local public employment offices have been merged into regional employment offices which are to be evaluated according to performance in achieving their goal of fast and durable reintegration of their registered job seekers. In this paper, we carry out a quantitative evaluation of the employment offices' performance based on production efficiency measures. We use Data Envelopment Analysis (DEA) technique to estimate the performance of all employment offices and then use a Tobit model to ascribe performance differences among different offices to exogenous variables and the offices' activities. Our evaluation approach and the ranking of employment offices may easily be interpreted by policymakers and provides guidelines for raising the efficiency of Swiss public employment service. The data consist of 156 Regional Employment Offices in Switzerland for the years 1998 and 1999. Our findings suggest that employment offices could improve their results through better management. We also find that differences in the external operating environment have a significant influence upon the efficiency of public employment service in Switzerland.

Keywords: Public employment service, Technical efficiency measurement, Data envelopment analysis, Labour market conditions.

JEL Classification Numbers: C14, C61, J68

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1 Introduction

The purpose of this paper is to examine the technical efficiency of the Swiss public employment service using a two-stage procedure. In the first stage, Data Envelopment Analysis (DEA) is used to compute technical efficiency for all Regional Employment Offices (REOs) operating in Switzerland during the period 1998-1999. In the second stage, a Tobit model is used to analyse the impact of external factors or of the operating environment on the variation in technical efficiency scores across employment offices. Also, some conclusions are drawn relative to the efficiency of the activities undertaken by REOs to improve the matching process in the labour market. The results of this study provide a relative ranking of employment offices with respect to their ability to meet pre-defined targets which can be used as guidelines for the offices to become more efficient.

The motivation of this study originates from the enforcement in 2000 of a new agreement between the Swiss federal authorities and cantons relative to the introduction of performance-based budgeting of Regional Employment Offices.[1] This new agreement became necessary because the Swiss unemployment policy was shifted in 1996 from a passive income maintenance programme to active labour market measures aiming at a faster reintegration of the unemployed into the labour market. Performance measurement is necessary to complement performance-based budgeting with an incentive for employment offices to become more efficient. The few studies that evaluate the efficiency of public employment service in different countries mainly concentrate on the activities of employment offices rather than on their results in improving the matching between the unemployed and vacancies (Cavin and Stafford, 1985; Torgersen et al., 1996). In Switzerland, the evaluation of performance of employment offices is currently carried out my means of simple ratio analysis technique.[2] Sheldon (1999) uses the DEA technique but does not analyse the effect of the operating environment on efficiency. We propose an alternative model that does account for the targets of REOs as specified by the Swiss State Secretariat for Economic Affairs (Seco) and enables us to identify exogenous factors that influence the efficiency of employment offices.

The study unfolds as follows: Section 2 describes some institutional aspects of organisation of the Swiss public employment service. Section 3 discusses the model of efficiency measurement. Section 4 describes the data and Section 5 reports the estimation results. In Section 6 we summarize the findings.

2 Regional Employment Offices in Switzerland

Like other Europeans countries, Switzerland has undergone a severe recession in the beginning of the 1990s, with the unemployment rate jumping from below 1% to more than 7%. This shock has profoundly affected labor market conditions in a very short period of time as opposed to the previous oil shocks which also had a strong impact on the Swiss economy, but with unemployment spells of much shorter duration. These new state of affairs has led the Swiss Federal government to

[1] See the *Accord ORP/LMMT/Autorité cantonale* (2000).

[2] See the model proposed by ATAG Ernst and Young (1999).

adjust its unemployment policy. From the second part of the 1990's, an ambitious active labour market policy aiming at a faster re-integration of job seekers into the labour market was launched. Several active labour market programmes (ALMP) were organized by the public employment offices since 1996. The public employment service itself has undergone a deep transformation: in 1996, more than 2,000 local employment offices were transformed into about 160 Regional Employment Offices. The objective of this reform was to provide more professional and efficient services to job seekers and employers to lower structural unemployment.

The new Regional Employment Offices received more generous funding directly from the federal authorities. At the same time, due to substantial regional differences (Raemy, 1996), the federal legislator decided to let the REOs free to organize their activities in the way they judge the most adequate to their local labour market conditions. Accordingly, substantial differences were indeed reported in the use of various active labour market programmes (such as courses to improve basic skills, language courses, computer courses, subsidised jobs, employment programmes) among cantons and in the administrative organization of the REOs.

As part of the new unemployment policy and in order to control and improve their efficiency, the REOs must report the results of their activities to the Swiss State Secretariat for Economic Affairs (Seco). The distinctive feature of the Swiss supervision system for the public employment service is that REOs are evaluated not with respect to the number of tasks performed but with respect to some pre-specified goals. The Swiss authorities are currently implementing a financial framework which is designed to encourage employment offices to become more efficient. Beginning from 2002, offices achieving the best results will be rewarded and offices achieving the worst results will be sanctioned.

The goals of the REOs are explicitely given in the *Accord ORP/LMMT/Autorité cantonale* (2000). They are correlated with the number of persons in structural unemployment so that when the REOs improve their results, the structural unemployment should decrease, and *vice versa*. The four goals are aimed at reducing: 1) the mean REO's duration of unemployment; 2) the number of persons entering long-term unemployment (i.e. longer than 1 year); 3) the number of persons loosing the entitlement to federal unemployment insurance (UI) benefit (i.e. who are unemployed for more than 2 years); and finally, 4) the number of persons re-entering unemployment in less than four months after having found a job.

Currently, Seco is evaluating the results of employment offices using simple ratio analysis. The four goals of REOs are valued differently by the Seco. The first goal was given the greatest importance with a weight of 0.5. The three remaining goals were given weights of 0.2, 0.2 and 0.1, respectively. However, in this paper, we opt for a method which does not constrain the weighting of REOs' result variables.

3 The model of efficiency measurement

This section begins with a description of the conceptual framework of the economic activity of the REOs. This framework leads us to the specification of a quantitative model to evaluate the technical efficiency of REOs.

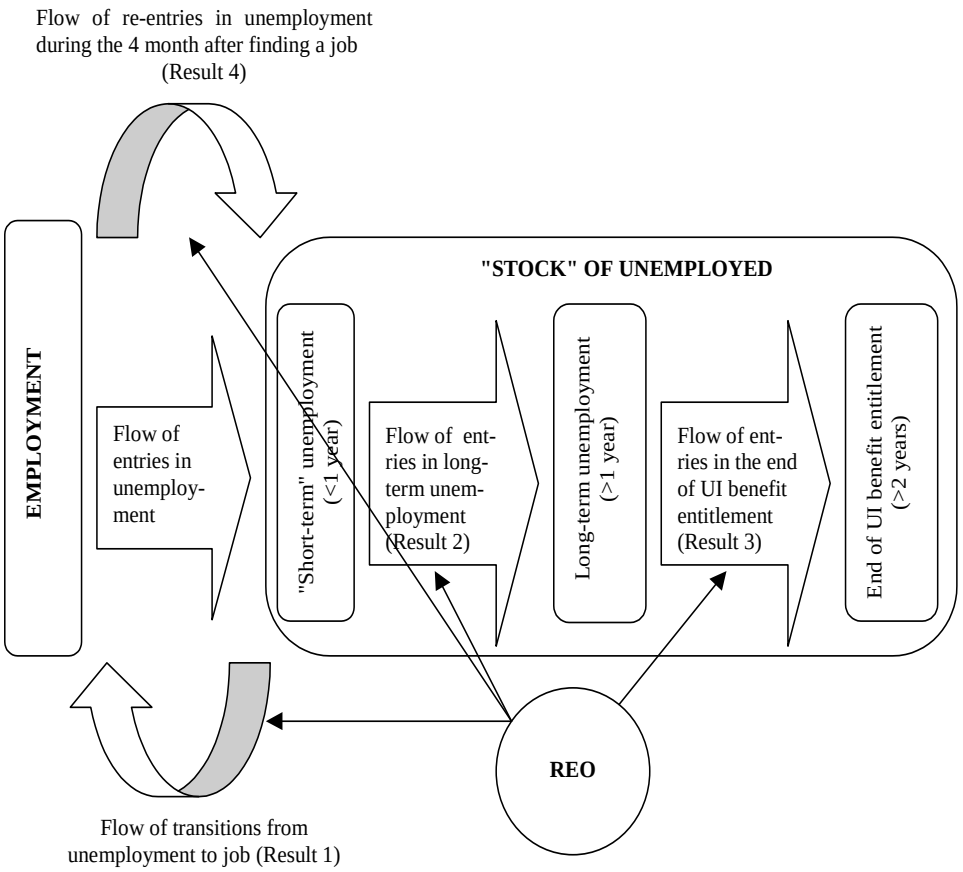

Figure 1: Economic activity of the Regional Employment Office. Transition flows that can be influenced by the REO are indicated by the arrows originating from the REO

3.1 Economic activity of Regional Employment Offices

Before 1996, the role of public employment offices in Switzerland was limited mainly to the passive income maintenance of the job seekers receiving the unemployment insurance (UI) benefit. The tasks of the offices were mainly administrative, confined to the calculation of unemployment insurance payments and control activities of effective job search of the registered unemployed. The efficiency of employment offices was evaluated with respect to the resources used and the number of activities performed (e.g., number of cases handled). However, as reported in Section 2, since 2000 the REOs are evaluated not with respect to their activities, but with respect to their results in lowering structural unemployment.

The ultimate goal of employment offices is to match job seekers with potential employers. The office cannot enforce the matching, but must confine itself to services that facilitate the final contracting by the parties themselves. By choosing the appropriate set of activities (e.g., contacting the employers on the local labour market, job councelling sessions with job seekers, organisation of the active labour market programmes, financial sanctions), they can reduce the duration of unemployment and prevent re-entries into unemployment. The day-to-day activities of a REO are viewed as means to achieve its goals in the matching process.

The economic activity of REOs may be represented with the diagram in Figure 1. The "stock" of unemployment is formed by entries into unemployment mainly from employment. This flow of entries depends on the local economic conditions and may not be controled by the REO. Therefore, at least in the short run, the "stock" of unemployment in the local labour market is exogenous to the office. The employment office may influence the transition flows within the "stock" of unemployed and some transition flows in and out of unemployment.

The most direct way for a REO to reduce the number of job seekers and the mean duration of unemployment spells is to increase the number of hires. We take the number of hires as the first result variable of REOs consistent with Seco's objective of reducing the mean duration of unemployment.

At the same time, as the number of transitions to employment increases, the offices have to avoid that the most disadvantaged job seekers stay unemployed for long durations. In order to insure that the REOs do not concentrate their efforts on the job seekers having the best individual hiring characteristics, Seco is also evaluating the office's performance in minimizing the number of entries into long-term unemployment and those reaching the end of UI benefit entitlement. These two variables are respectively the second and third result variables of the REOs.

Finally, in order to promote a durable re-integration into the employment, the REOs have to minimize the number of job seekers who re-enter unemployment. This variable is the fourth result of the REOs. It may be viewed as an indicator of the quality of re-integration achieved by the office. To achieve their goal of a better matching between unemployed and vacancies, REOs have ressources that will be discussed below.

3.2 Measurement of technical efficiency

By technical efficiency of a production unit, we mean a comparison between observed and optimal values of its outputs and inputs. Koopmans (1951, p. 60) provided a formal definition of technical efficiency: a producer is technically efficient if an increase in any output requires a reduction in at least one other output or an increase in at least one input, and if a reduction in any input requires an increase in at least one other input or a reduction in at least one output. Thus, a technically efficient producer is located on the production frontier while a technically inefficient producer is located below this frontier.

If we are interested in increasing outputs rather than saving inputs, then a radial measure of technical efficiency introduced by Farrell (1957) is defined as the maximum equiproportionate increase in all outputs that could be achieved with the given amount of inputs. This measure gives an idea of the difference between observed and optimal values of outputs, or between observed values of outputs and the efficient production frontier. The goal of efficiency analysis is to estimate the production frontier and to compute the distance between the optimal point on this frontier and the actual values of outputs.

To estimate the production frontier, several possible econometric and mathematical programming techniques are available (Lovell, 1993). We analyze the efficiency of the Regional Employment Offices on the basis of deterministic non-parametric technique named Data Envelopment Analysis (DEA). DEA is a mathematical program-

ming technique initiated by Charnes, Cooper and Rhodes (1978).[3] It has proved particularly useful when evaluating efficiency of public services since it requires no information on the prices of inputs and outputs (that are often unavailable for the public goods) and it captures all relevant information in whatever metrics. DEA places no parametric structures on the production frontier which is a valuable feature since little information is available on the REOs' "production technology".

DEA estimates a multivariate production frontier by constructing a piecewise-constant envelope of the cloud of data points in the inputs/outputs space. Therefore, the efficiency of a producer is measured relative to the efficiency of all the other producers. The assumption of variable returns to scale allows to envelop the cloud of data points as tightly as possible. Suppose we have n REOs, each of them consuming p inputs and producing q outputs. The output increasing efficiency measure E_O for the office O equals the inverse of the optimum value of the linear programming problem below, i.e., $E_O = \lambda_O^{-1}$

$$\begin{aligned} \max_{\{\lambda_O,\gamma\}} \ & \lambda_O \\ \text{subject to} & \\ \lambda_O y_O - Y'\gamma &\leq 0 \\ -x_O + X'\gamma &\leq 0 \\ i_n'\gamma &= 1 \\ \gamma, \lambda_O &\geq 0, \end{aligned}$$

where $X : (n \times p)$ matrix of the n observed input vectors, $Y : (n \times q)$ matrix of the n observed output vectors, $\gamma = (\gamma_1, \ldots, \gamma_n)'$ is a $(n \times 1)$ vector and i_n is a $(n \times 1)$ vector of 1's. $x_O : (p \times 1)$ and $y_O : (q \times 1)$ denote the vectors of inputs and outputs for the office O respectively. The programme should be solved n times.

The efficiency measure (or score) E is equal to 1 if the producer is fully efficient and is smaller than 1 otherwise. It may be given the following interpretation: a score of 0.8 means that given the amount of the inputs consumed, the production unit produces only 80% of its maximum output level. Therefore, to be efficient with respect to at least one output, it has to increase its actual outputs' levels by a factor of $1/0.8 = 0.125$, i.e., by 12.5%, keeping inputs constant.

The solution value $\gamma = (\gamma_1, \ldots, \gamma_n)'$ indicates whether office i $(i = 1, \ldots, n)$ serves as a peer for office O. The offices that are peers define where the part of the frontier relevant to O is and hence define efficient production for O. The efficient production for O is the linear combination of its peers where the weights in this linear combination are the elements of vector γ. For example, if $\gamma_i = 0$, then office i is not a peer for O. However, if $\gamma_i > 0$, say $\gamma_i = 0.6$, then office i is a peer office with 60% weight placed on deriving the target efficient output and input level for office O. An efficient office has no peers. The number of times it is a peer for other offices gives the number of dominated offices.

The DEA piecewise-constant envelope is illustrated in Figure 2. We assume that five hypothetical offices use two inputs to produce a single output. Offices A, B, C and D are fully efficient—indeed, their output level cannot be increased without

[3] See the reviews of the methodology in Seiford and Thrall (1990) and Ali and Seiford (1993).

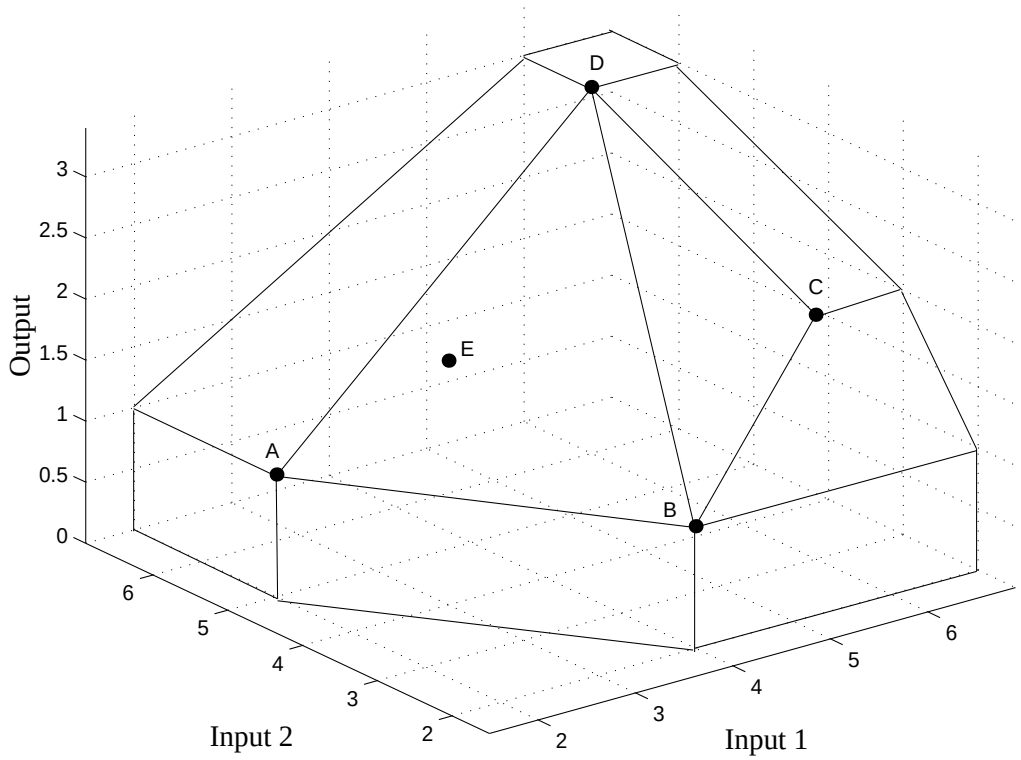

Figure 2: DEA-VRS envelope. Offices A, B, C and D are fully efficient. Office E (lying below the envelope) is not efficient, because it could increase its output given its use of inputs.

increasing the input consumption. Office E is inefficient, because it could produce more output with its current consumption of inputs.

We now turn to the issue of applying the DEA technique to the data from Regional Employment Offices. As depicted in Figure 1, the efficiency of REOs is to be measured with respect to their results in achieving a large number of transitions from unemployment to employment; a small number of transitions into long-term unemployment; the number of people reaching the end of UI benefit entitlement and a small number of re-entries into unemployment. Therefore, the REOs have to manage four transition flows: one of them is to be maximized and the other three are to be minimized.

The DEA method requires definition of the inputs and outputs so that the inputs are to be conserved and the outputs are to be increased. In the REO setting, we cannot consider the raw results 2-4 as outputs. Indeed, to be efficient, a REO has to decrease these variables rather than to increase them. Instead of developing either the reciprocals or proxies for the results 2-4 (which leads to possible non-linear transformations of the original data), we enter them in the DEA linear program as inputs rather than as outputs.

The proposed DEA programme comprises one output to be maximized which is the number of transitions from unemployment to employment and five inputs. There are two types of inputs. The inputs of the first type are the result variables of REOs that are to be minimized—i.e., the number of transitions into long-term

unemployment, the number of unemployed losing federal UI benefit entitlement and the number of re-entries into unemployment. The inputs of the second type are the "resources" of the REOs.

The public services provided by REOs are produced by labour and capital. Labour is the dominant cost component in placement service production. However, the labour input is not homogeneous. Indeed, the employees working in REOs may be specialized in administrative tasks, computer support, tasks relative to active labour market programmes or in job councelling involving the direct contact with the job seekers. Furthermore, some of the job counsellors are given specialized training with possibly a formal diploma (*brevet fédéral*). Finally, the job tenure of the counsellors should be an important determinant of the knowledge of the local labour market conditions and should therefore influence the results of their activities.

It was only possible to get data on the number of REOs job counsellors for the period analysed. No information on the formal diploma was available. However, it may be argued that the job counselling is the main activity of REOs. The job counsellors propose to the job seekers the vacant jobs available on the local job market, decide on the participation of the unemployed in the labour market programmes and may apply sanctions (e.g., unemployment insurance benefit cuts) if the job seekers do not comply with the demands of the office. As the job counselling is the central activity of the offices, the other tasks performed at the office are mainly intended to give to the job counsellors the possibility to work in an efficient way. Assuming that the job counsellors were given equal work conditions, the number of job counsellors is then a reasonable proxy for the labour input of REOs. While more detailed information on the specific training of job counsellors and the other staff employed at REOs would be quite valuable, we perform our analysis with the number of job counsellors as a proxy for the REO's labour input.

For simplicity, capital in the form of office space and computer terminals is assumed to be proportional to labour input and, due to common standards, varies very little across offices. Strict complementarity of labour and capital on the input side is therefore a reasonable assumption. Consequently, efficiency in the use of labour is the main factor for productivity differences among offices and the capital input is not taken into account in this study.

In order to account for the fact that the number of unemployed per job counsellor varies substantially among offices (cf. Section 4), we include the number of unemployed with UI benefit entitlement registered at the REO as the last input of REOs. Including this input into the DEA program also avoids us to identify as efficient the REOs that have had a large number of unemployed who found a job simply because of the larger size of the REO.

Finally, we chose to apply the output increasing efficiency measure because of the importance given by the Seco to the number of transitions from unemployment to work. In addition, the number of unemployed and the number of job counsellors (which enter the DEA on the input side) are not under the control of the office (at least in the short run). In the REOs context, the office's managers have more control over the DEA's output which is the number of exits from unemployment than over the DEA's inputs which include the number of registered unemployed and the number of job counsellors. Therefore, the output increasing efficiency measure is more appropriate than the input decreasing measure.

The proposed model of efficiency measurement has some drawbacks. They stem from the fact that both "resources" and results of the offices appear on the input side of the DEA programme. First, since the result variables are introduced both as inputs and as outputs, no conclusion can be made relative to the scale efficiency of REOs. Therefore, no recommandation can be made on the optimal size of the offices.

The second point may be illustrated with the hypothetical case depicted in Figure 2. Let us suppose that the offices have one output to maximize (number of hires) and use only two inputs. Input 1 is the number of unemployed and input 2 is the number job counsellors. DEA gives the same efficiency score of 1 to the offices A and B which have the same "output level". However, a simple computation shows that the exit rate from unemployment *per job counsellor* is larger for the office A than for the office B. Hence, offices A and B should not be assigned equal efficiency scores. However, note that all offices producing the same level of output as A or B, but not lying on the DEA envelope will be assigned efficiency scores smaller than 1. Since these less efficient offices also have the rates of exit from unemployment *per counsellor* that are smaller than those of A and B, the problem is not severe enough to compromise the model.

The final remark concerns the possibility of substitution among inputs. Since the DEA inputs may either be the result or resource variables, an office may be identified as efficient either because it minimizes e.g. the number of entries into long-term unemployment or because it achieves the same performance as to the output to maximize with a smaller number of job counsellors (see Figure 2—input 1 is say the number of entries in long-term unemployment and input 2 is the number of job counsellors: office A is as efficient as B). From the political point of view, it may be more important to provide the REOs with the incentive to minimize the flow of entries into long-term unemployment rather than to minimize the number of job counsellors. Therefore, it may be useful to introduce the weight restrictions on the contributions of the inputs and outputs to the total efficiency measure.[4]

After computing the efficiency scores for all offices, we analyze how the efficiency of REOs is influenced by the exogenous operating conditions beyond the control of the office. Also, we would like to know whether, given their results and exogenous conditions, the actual levels of activities of REOs are optimal. The results of our estimations are presented in Section 5.

4 Data

Our data pertain to 156 Regional Employment Offices that operated during the period beginning in April, 1998 and ending in March, 1999 (i.e., 12 months). Most of the data were provided by Seco which uses them for controlling purposes. The data consist of monthly averages which allows to get rid of the cyclical fluctuations. We also completed our data set with some variables characterizing the heterogeneity of the labour markets among different cantons. These data consist of cantonal variables (e.g., unemployment rates by canton) and originate from different official sources.

[4]See Allen, Athanassopoulos, Dyson and Thanassoulis (1997) for an overview of the weight restrictions in DEA.

Some of the REOs were aggregated for different reasons such as a close complementarity of their activities or re-organisation[5] While rendering more difficult the interpretation of the results, aggregation has the advantage of making them comparable to those obtained in the ATAG Ernst and Young (1999) study. Aggregation reduces the number of offices to 137. Five additional offices were deleted from our data set due to missing values in the result or resource variables, thus reducing the number of observations to 132.

The variables used in this study may be separated in four distinct groups. The first group comprises the four variables measuring the REOs' results (see Section 3). The second group is the "resources" of REOs—i.e., the number of job counsellors and the number of registered UI benefit recipients.[6] The next group of variables are the REOs' activities. These include the number of days when UI benefits were cut off, the number of counselling sessions, the number of unemployed in intermediate earnings programmes[7] and the active labour market programmes (ALMP) organized by the office. The most frequently used ALMP-measures are the courses to improve basic skills (aiming at improving the effectiveness of individual job search and self-esteem), language courses (mostly offered to non-Swiss unemployed), computer courses (basic word processing and spreadsheet usage), employment programmes and subsidised jobs.[8]

Finally, the last group of variables describes the office's operating environment, i.e. the exogenous variables that influence the results of the office but cannot be influenced by the office itself (at least in the short term). This group is formed of the variables relative to the office (e.g., number of woman registered at the office) and of the variables relative to the canton (e.g., the unemployment rate in canton). The latter variables originate from different official data sources, while all remaining variables were obtained from Seco. Table A1 in Appendix reports the descriptive statistics for all available variables. The choice of cantonal variables are dictated by labour market considerations.

More information about the relations among these variables are obtained by performing the Principal Component Analysis (PCA) (see e.g. Saporta, 1990). The projections of the original variables on the factorial plans obtained with PCA are reported in Figure 4 in the Appendix. To compute these projections, we normalized all the variables except those relative to cantons by the number of UI benefit recipients registered in the REO in order to avoid the high correlations between the variables.

To interpret Figure 4, note that if the angle between two variables projected on the factorial plan is close to 0, these variables have a strong positive correlation. If the angle is close to 90 degrees, there is no correlation and if the angle is close to 180

[5]See ATAG Ernst and Young (1999) for a more detailled description of the reasons of aggregation.

[6]The wide range of variation in the number of job counsellors per UI benefit recipient was reported in Curti and Meins (1999).

[7]It consists of a wage subsidy for temporary jobs in the regular labour market that would otherwise not be taken up by the unemployed.

[8]These four programmes represent approximately 85.4% of the total ALMP supply in Switzerland (see Lalive, Van Ours and Zweimüller 1999; OFDE, 1998). The remaining 14.6% are the programmes for young unemployed ("motivation semester"), incentives to independent activity, etc.

degrees there is a strong negative correlation. Variables projected near the center of the unit cercle are badly represented on the factorial plan—therefore, care should be exercised in the interpretation of the relations of these variables with the others.

Limiting our analysis to the first three factorial axes allows to explain 52.07% of total variance in the data. The first, second and third axes explain 24.97%, 15.19% and 11.91% of total variance respectively. With so many variables, no clear interpretation can be given to the factors. However, some interesting relations do appear among the variables.

The PCA shows that the REOs that achieve a large number of hires (result 1) usually have a large number of re-entries into unemployment (result 4) and large numbers of entries into long-duration unemployment (result 2) and at the end of UI benefit entitlement (result 3). There is some evidence for a trade-off between the number of hires and the quality of the job found, on the one hand, and between the number of hires and the number of job seekers experimenting long durations of unemployment, on the other hand.

A high proportion of woman in REO is positively correlated with the proportion of job seekers experimenting long unemployment spells (variable "woman" is projected near the results 2 and 3). It is negatively correlated with the number of hires. However, women appear to re-enter unemployment less frequently than men. This may be due to their higher propensity to leave the labour market.

It is interesting to note that a larger proportion of job seekers who had a high hierarchical position in their last job is negatively correlated with the number of transitions to employment. As it could be expected, the higher unemployment rate in the canton where the REO is located is also negatively correlated with the number of transitions to employment. The affiliation of job seekers to economic sectors subject to cyclical variations of activity is positively correlated to the number of hires (result 1) as well as to the number of re-entries into unemployment (result 4). In order to provide a more meaningful interpretation of the other correlations and factorial axes, it would be necessary to limit the number of variables by deleting those that are badly represented or redundant. For reasons of space, we do not carry out such an analysis here. The following section gives more conclusive results on the relation among the performance of REOs and the exogenous variables.

5 Assessing the performance of Regional Employment Offices

In this section, the model of performance measurement introduced in Section 3 is applied to the Regional Employment Offices data described in Section 4. We first report the evidence of considerable variation in performance among REOs. We then associate a portion of measured inefficiency with some environmental factors that are beyond the control of employment offices. Finally, we present some recommendations on the optimal level of REOs activity variables and give a classification of the offices as efficient or inefficient in the organization of their activities.

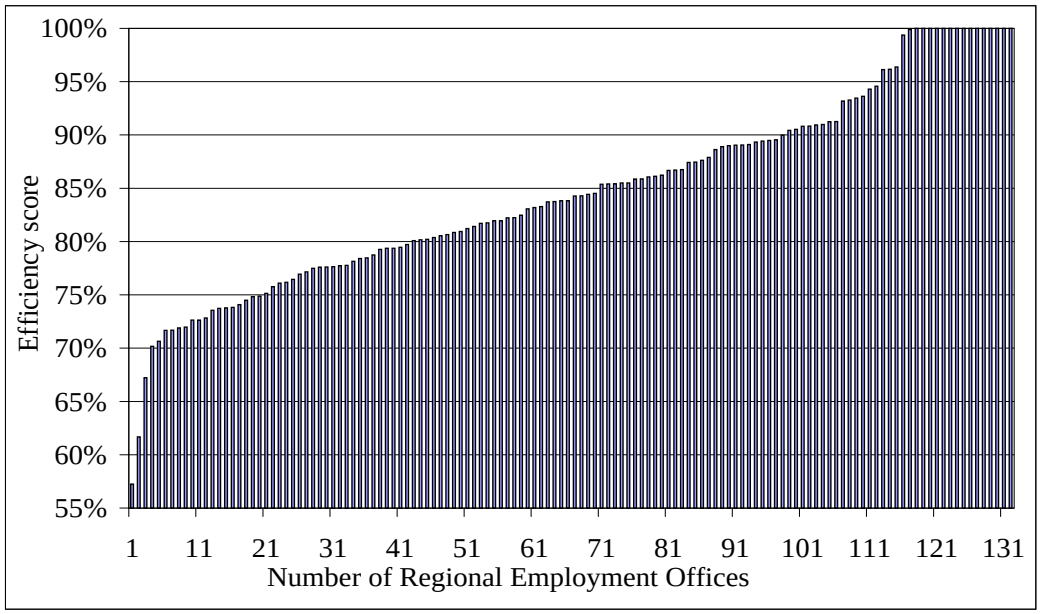

Figure 3: Output-oriented DEA-VRS efficiency scores (E); mean efficiency score $E_{\text{mean}} = 84.59\%$

5.1 Results on efficiency

The DEA problem presented in Section 3 was solved with the EMS software of H. Scheel (2000). The mean efficiency score E is 84.59%. The standard deviation is 9.06%. The minimum efficiency is 57.25% and the number of efficient offices is 15 (i.e., 11.36% of 132 aggregated or not aggregated offices analyzed). The efficiency distribution is illustrated in Figure 3 where offices are ranked from the lowest to the highest efficiency.

Among the 15 efficient REOs there are no offices that are efficent by default. An office would be efficient by default if, given the level of inputs it uses, there is no other office which uses similar levels of inputs but produces a lower output. This is basically a finite sample problem. For example, an office whose size is substantially larger or smaller than the size of all other offices will be identified as efficient by DEA. While being ascribed an efficiency score of 1, such an office could possibly improve its results. Therefore, care should be exercised in interpreting the efficiency scores for the REOs that dominate no other or few other offices.

However, the efficient offices with ID's 13, 24 and 45 dominate only 1, 2 and 3 other offices, respectively. Since these efficient offices were compared to very few other offices, their performance should be further checked on the case study basis because their efficiency score of 1 may reflect mainly the small sample problem rather than true efficiency. Other efficient offices dominate more than 5 other offices each. Finally, note that 3 of 15 efficient REOs are the aggregated offices. As it was mentioned in Section 4, aggregation of offices renders the interpretation of results more difficult.

In addition to the relative ranking of REOs, the DEA technique provides some specific guidance to the means for improving the performance of a particular REO.

For example, the REO with the ID 3 was given the efficiency score of $E = 0.8384$. This score indicates that to be fully efficient, this office should increase the number of hires (result 1) by a factor of $1/0.8384 = 1.1928$ (i.e. a 19.28% increase), keeping constant the number of registered UI benefit recipients, offices' job counsellors, entries into long-term unemployment (result 2), number of persons losing UI benefit entitlement (result 3) and the re-entries into unemployment (result 4).

To establish the efficiency score $E = 0.8384$, the office 3 was compared to the efficient offices with ID's 43, 47, 58 and 60 (its peers) that were given weights of 0.18, 0.01, 0.74 and 0.07, respectively. It may be that the performance of the REO 3 could be improved by examining these similar, but more efficient, offices carefully to discover what they are doing differently.

5.2 Determinants of inefficiency

In this subsection, we attempt to explain the variation of (basic) efficiency scores, E_0, across REOs by regressing them on an appropriate set of explanatory variables. This initial set is naturally formed by the activities provided inside the REOs and, secondly, by all exogenous variables relative to REOs and those relative to the cantons (see Table A1 in the Appendix). The estimated equation is the following:

$$E_0 = X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + \epsilon, \tag{1}$$

where X_1 is the matrix of REOs' activities, X_2 is the matrix of exogenous variables relative to the REOs, X_3 is the matrix of exogenous variables relative to cantons and ϵ is a vector of normally distributed error terms. In order to prevent size effects, all the variables relative to REOs (i.e., X_1, X_2) have been divided by the REO's number of registered UI benefit recipients. Now, given that the dependent variable, E_0, is both left- and right-truncated, we use a Tobit regression model to estimate the vector of unknown parameters β_1, β_2 and β_3. The results are presented in Table 1.

In order to improve the predictive power of the model, we choose to limit the variables to those having a statistically significant (at the 0.1 level) impact on the basic efficiency scores, E_0. As can be seen from Table 1, two out of the four REO's activities have been retained: the days of sanctions relative to the number of UI recipients and the relative number of persons involved in intermediate earnings programmes. Sanctions seem to increase significantly the REO's relative efficiency while, to a lower extent, the use of intermediate earnings programme decreases it.

The different proportions of foreigners among UI recipients may lower efficiency for different reasons. In this case, only the fractions of workers having a C residence permit and of those holding a short-term permit (other than A or B) decrease REO's relative performance. The same can be said about the internal REOs' fraction of women. Generally speaking, this may be explained by the relatively lower skills characterizing these three workers' groups in comparison to male swiss workers. Such an argument is even more relevant to foreign short-term residence permit holders, who probably face some language and cultural barriers, given their recent arrival in Switzerland. However, even though the matching process may be harder and longer for these workers' groups, the existence of some discriminating behaviour in the Swiss labour market may aggravate the difficulty to reinsert them.[9] More-

[9]See for example de Coulon (1999) and Flückiger and Ramirez (2000).

Table 1: Determinants of inefficiency: Tobit estimates for basic efficiency scores

Variable	Coef.	St.dev.	t-stat
UIB cut	0.075	0.031	2.406
Int earnings	−0.133	0.078	−1.693
Part recipients	0.144	0.053	2.721
Women	−0.487	0.221	−2.206
Permit O	−13.880	3.841	−3.614
Permit C	−0.291	0.110	−2.643
Cyclical	0.370	0.128	2.887
Women cant	2.158	0.631	3.420
Part-time cant	−1.109	0.313	−3.535
Constant	0.276	0.229	1.208
Log$L$		-115.385	
Pseudo R-square		0.368	
Standard error		0.080	

Source: 132 Regional Employment Offices. Own estimation.
Note: 15 right-censored observations at 1.

over, as previously mentioned, women have a higher probability of transition from unemployment to inactivity. Hence, it could be argued that both REOs' involvment and female UI recipients motivation is possibly lower.

As regards the cantonal variables, only the fraction of part-time jobs and the proportion of women in the labour force appear to have a significant impact on the REOs' relative performance. A higher proportion of woman employed in the canton can be interpreted as a sign of greater labour market flexibility, while a higher proportion of part-time jobs may reflect a higher extent of "secondary" jobs in the local labour market. Finally, to have a global picture on the incidence of activity and exogenous variables on the REOs' relative efficiency, we computed cantonal averages (geometric means) of basic scores, E_0, and of corrected scores, $\hat{E}_0$, which are presented in Table 2. Even though the difference between these two scores is not significant at the national level, there are some important differences among REOs at both cantonal and national levels.

5.3 Optimal level of REOs activity variables

The question we now address is wether the REOs' activities are efficiently used or not, given the exogenous variables affecting the employment offices. To this end, we first compute new efficiency scores using DEA by including sequentially each activity as a new input.[10] We then obtained the following efficiency score differentials due to the use of activity $i = 1, 2, 3$:

$$\Delta E_i = E_i - E_0 \tag{2}$$

[10]The analyzed activities were introduced in the DEA programme as "outputs".

Table 2: Mean basic E_0 and corrected $\hat{E}_0$ efficiency scores by canton

Canton	Number of REOs	E_0	$\hat{E}_0$	Canton	Number of REOs	E_0	$\hat{E}_0$
AG	12	0.8190	0.8402	NO	1	0.9083	1.0000
AI	1	1.0000	0.8680	SG	7	0.7915	0.8020
AR	1	0.8307	0.8995	SH	1	0.8586	0.7944
BE	16	0.8717	0.8608	SO	9	0.7817	0.7920
BL	6	0.7614	0.7990	SZ	2	0.9007	0.8789
BS	3	0.8629	0.8754	TG	3	0.8416	0.7885
FR	5	0.8335	0.8602	TI	5	0.8861	0.8949
GE	1	1.0000	0.8480	UR	1	0.7773	0.7773
GL	1	0.7355	0.8295	VD	16	0.8503	0.8654
GR	6	0.9759	1.0000	VS	5	0.8626	0.8728
JU	3	0.8213	0.8645	ZG	1	0.8862	0.8368
LU	5	0.9650	0.8963	ZH	19	0.8036	0.8163
NE	2	0.9467	0.8434	**CH**	**132**	**0.8459**	**0.8520**

Source: 132 Regional Employment Offices. Own estimation.
Note: There is only one REO for the semi-cantons Obwald and Nidwald (NO).

where E_i is the new efficiency score when activity i has been introduced as output in the production process. These differentials are strictly positive, given that the introduction of a new input will increase the efficiency score obtained when using DEA techniques. These computed efficiency score differentials are presented in Table 3.

Table 3: Estimated basic efficiency scores and score differentials due to activities

Variable	Mean	St.dev.	Min	Max
Basic scores: E_0	0.8459	0.0906	0.5725	1.0000
counselling sessions: ΔE_1	0.0537	0.0650	0.0000	0.3786
Intermediate earnings: ΔE_2	0.0274	0.0514	0.0000	0.2802
ALMP: ΔE_3	0.0266	0.0525	0.0000	0.2499

Source: 132 Regional Employment Offices. Own estimation.

The introduction of the number of counselling sessions is the activity which creates the greater variability in comparison to the basic efficiency scores, E_0. However, comparing the ratio between the mean and standard deviation associated with each efficiency score differentials, we see that the other two activities have a relatively high impact on the variability of efficiency scores among the REOs.

The second stage consists now in estimating the corrected efficiency score differentials by using a Tobit regression model. In this case, however, we regress the different ΔE_i on the exogenous variables relative to REOs and cantons (i.e., X_2, X_3,

Table 4: Mean estimated inefficiency of activities by canton

Canton	Number of REO	$\widehat{\Delta E}_1 - \Delta E_1$	$\widehat{\Delta E}_2 - \Delta E_2$	$\widehat{\Delta E}_3 - \Delta E_3$
AG	12	−0.0044	−0.0067	−0.0290
AI	1	0.0118	−0.0247	0.0090
AR	1	−0.1081	−0.1145	−0.0467
BE	16	−0.0059	−0.0130	−0.0202
BL	6	−0.0563	−0.0501	−0.0391
BS	3	0.0326	−0.0380	−0.0497
FR	5	−0.0067	−0.0675	−0.1034
GE	1	0.0219	−0.0231	−0.1081
GL	1	−0.0814	−0.0370	−0.0003
GR	6	−0.0541	−0.0189	−0.0484
JU	3	−0.0218	−0.0328	−0.0445
LU	5	−0.0287	−0.0227	0.0039
NE	2	0.0961	0.0502	−0.0126
NO	1	0.0900	0.0130	−0.1137
SG	7	0.0004	−0.0219	−0.0120
SH	1	0.0722	0.0489	0.0223
SO	9	−0.0021	0.0053	−0.0015
SZ	2	−0.0598	−0.0656	−0.0296
TG	3	0.0296	−0.0262	−0.0747
TI	5	−0.0899	−0.0733	−0.1087
UR	1	−0.0420	−0.0968	−0.0823
VD	16	−0.0407	−0.0239	−0.0664
VS	5	−0.0269	−0.0338	−0.0132
ZG	1	−0.0562	−0.0204	−0.0830
ZH	19	0.0171	−0.0049	−0.0318
CH	**132**	**−0.0137**	**−0.0216**	**−0.0384**

Source: 132 Regional Employment Offices. Own estimation.
Note: There is only one REO for the semi-cantons Obwald and Nidwald (NO).

see Equation (2)). The results of these three regressions are presented in Tables A2 to A4 of the Appendix. A positive sign of the coefficient means that the given exogenous variable increases the efficiency score differential through the usage of activity i. For example, in Table A2, a higher REOs proportion of women reduces the efficiency of counselling sessions, while a larger fraction of persons receiving an invalidity rent increases the efficiency of this activity.

Finally, the use of an REOs activity i will be considered as inefficient when the difference between the predicted efficiency score differential, $\widehat{\Delta E}_i$, is larger than the observed efficiency score differential, ΔE_i. Table 4 presents average results by canton.

Of the 132 REOs, 64 do not use efficiently counselling sessions, 42 could increase their efficiency by better targetting of intermediate earnings programmes and 27 of them do not use active labour market programmes efficiently. The number of REOs

considered as inefficient on the use of the three selected activities is 7. These figures can explain the strong variability among cantons, as can be seen from Table 4. At the national level, however, these three activities were used efficiently.

6 Conclusions

The Swiss authorities are implementing performance-based budgeting for public employment service to lower structural unemployment. Performance measurement of public Regional Employment Offices is necessary to reap the full rewards of performance-based budgeting. Efficiency measures encourage employment offices to improve their efficiency because this information makes them more accountable to the authorities.

To estimate the relative technical efficiency of Regional Employment Offices in Switzerland between April 1998 and March 1999, we used non-parametric Data Envelopment Analysis technique. We found inefficiency on the order of 15% of best observed performance, which gives the idea of the magnitude of possible improvement as to the number of hires, and we established a relative ranking of employment offices from the lowest to the highest efficiency.

We then ascribed the variations in efficiency scores to the external operating environment beyond the control of REOs and to the variables describing the REOs' activities. We found that some socio-economic characteristics of the local labour market explain part of the variation in performances of employment offices.

We finally analyzed whether taking into account three out of the four REOs' activities may improve marginal REOs' efficiency. We reported that, for the national average, these three activities were used efficiently by the offices. However, we measured a substantial variability in terms of inefficiency use of REOs' activities, particularly in the use of counselling sessions.

Our evaluation approach and the ranking of Regional Employment Offices may easily be interpreted by policymakers and managers of REOs and provides guidelines for raising the efficiency of public employment service. For each inefficient employment office, a set of similar, but more efficient offices was found. The performance of inefficient offices could be improved by discovering what these similar, but more efficient, offices are doing differently.

This research could be extended by comparing our current results with those that could be obtained from a DEA methodology using *constrained* input and output weights. Introducing weights into DEA will allow us to take into account the preferences and value judgements of policymakers in Switzerland. We plan to further investigate these issues in the future.

References

[1] Accord ORP/LMMT/autorité cantonale (2000). Seco, Berne.

[2] Ali, A.I. and L.M. Seiford (1993). "The mathematical programming approach to efficiency analysis", in The Measurement of Productive Efficiency: Techniques and Applications, eds.: H. Fried, C.A.K. Lovell and S.S. Schmidt, chap. 3, Oxford Academic Press.

[3] Allen, R., A. Athanassopoulos, R. Dyson and E. Thanassoulis (1997). "Weight restrictions and value judgements in Data Envelopment Analysis: Evolution, development and future directions", *Annals of Operations Research* 73, pp. 13-34.

[4] ATAG Ernst and Young (1999). "Calcul des résultats des ORP compte tenu des facteurs d'influence exogènes", *Rapport Final*, version à l'intention du Seco et des directeurs des offices cantonaux.

[5] Cavin, E. and F. Stafford (1985). "Efficient provision of employment service outputs: A production frontier analysis", *Journal of Human Resources* 20, pp. 484-503.

[6] Charnes, A., W.W. Cooper and E. Rhodes (1978). "Measuring the efficiency of decision making units", *European Journal of Operational Research* 2, pp. 429-444.

[7] Curti, M. and E. Meins (1999). "Politique suisse du marché du travail: différences résultant de sa mise en application au niveau du service le l'emploi", *La Vie économique—Revue de politique économique* 2/99, pp. 64-70.

[8] de Coulon, A. (1999). "Four essays on the labor market assimilation of immigrants in Switzerland". Phd Thesis No. 494, Department of Economics, University of Geneva.

[9] Farrell, M.J. (1957). "The measurement of productive efficiency", *Journal of the Royal Statistical Society* Series A, General, 120(3), pp. 253-281.

[10] Flückiger, Y. and J. Ramirez (2000). "Analyse des salaires entre les hommes et les femmes sur la base de la LSE 1994 et 1996", Report No. 10, *Observatoire universitaire de l'emploi*, University of Geneva.

[11] Gerfin, M. and M. Lechner (2000). "Ökonometrische Evaluation arbeitsmarktlicher Massnahmen in der Schweiz", *mimeo*.

[12] Koopmans, T.C. (1951). "An analysis of production as an efficient combination of activities", in T.C. Koopmans, ed., *Activity Analysis of Production and Allocation*, Cowles Commission for Research in Economics, Monograph No. 13. New-York: John Wiley and Sons, Inc.

[13] Lalive, R., J. Van Ours and J. Zweimüller (1999). "The Impact of Active Labour Market Policies and Benefit Entitlement Rules on the Duration of Unemployment", IEW Working Paper 41 and CERP Discussion Paper 2451.

[14] Lovell, C.A.K. (1993). "Production frontiers and productive efficiency", in The Measurement of Productive Efficiency: Techniques and Applications, eds.: H. Fried, C.A.K. Lovell and S.S. Schmidt, chap. 1, Oxford Academic Press.

[15] OFDE (1998). "La situation sur le marché du travail en novembre 1998", Documentation de presse, Office Fédéral de Développement Économique et de l'Emploi, 22 décembre 1998.

[16] Raemy, N. (1996). "Le marché du travail en Suisse: quatre situations différentes. Une analyse par canton", *La Vie économique—Revue de politique économique* 12/96, pp. 50-53.

[17] Saporta, G. (1990). "Probabilités, analyse des données et statistique", Editions Technip.

[18] Scheel, H. (2000). "EMS: Efficiency Measurement System user's manual", *mimeo*, Operations Research und Wirtschaftsinformatik, University of Dortmund.

[19] Seiford, L.M. and R.M. Thrall (1990). "Recent developments in DEA: The mathematical programming approach to frontier analysis", *Journal of Econometrics* 46(1/2) (October/November), pp. 7-38.

[20] Sheldon, G. (1999). "The efficiency of public employment services: A nonparametric matching function analysis for Switzerland", *mimeo*, Labor Market and Industrial Organization Research Unit (FAI), Uiversity of Basle.

[21] Torgersen, A., F. Forsund and S. Kittelsen (1996). "Slack-adjusted efficiency measures and ranking of efficient units", *Journal of Productivity Analysis* 7, pp. 379-398.

Appendix

Table A1: Descriptive statistics for Regional Employment Offices (monthly averages of variables for the period April, 1998—March, 1999)

Variable and description	Mean	St.Dev.	Min.	Max.
REO's result variables				
Result 1 Nb of exits from unemployment	150.70	121.36	15.92	897.33
Result 2 Nb of entries in long unemployment	26.05	28.29	1.33	254.00
Result 3 Nb of entries at the end of UI benefit entitlement	26.35	24.40	2.08	152.42
Result 4 Nb of re-entries into unemployment in 4 month after having found a job	12.16	11.24	0.75	83.25
REO's activity variables				
UIB cut Nb of days when UI benefits were cut off	332.94	272.14	8.33	1348.75
Sessions Nb of counselling sessions	238.19	244.95	11.83	2047.83
Int earnings Nb of unemployed in intermediate earnings programme	286.18	232.83	2.58	1610.50
ALMP Nb of active labour market programmes organised by REO	260.37	191.07	7.50	994.67
REO's resource variables				
Recipients Nb of UI benefit recipients	1048.07	1027.70	74.00	8945.25
counsellors Nb of job counsellors	15.45	12.97	0.42	95.17
Exogeneous variables				
– Relative to REO				
High position Nb of UI benefit recipients who had a high position in last job	602.61	725.90	36.67	6742.75
Swiss Nb of Swiss UI benefit recipients	573.88	539.18	42.33	4752.50
Permit B Nb of foreign UI benefit recipients with yearly residence permit	133.40	127.99	6.92	952.17
Permit C Nb of established foreign UI benefit recipients	310.11	343.81	11.17	2943.33
Permit A Nb of foreign UI benefit recipients with saisonal residence permit	29.68	46.23	0	297.58
Permit O Nb of foreign UI benefit recipients with other residence permit	1.01	1.53	0	12.58
Cyclical Nb of UI benefit recipients who worked in the economic sectors subject to cyclical fluctuations	250.96	231.84	22.67	1398.58
Invalid Nb of UI benefit recipients with invalidity rent	28.36	26.08	0.92	200.25
Women Number of woman	482.83	512.97	24.08	4732.75
Part recipients Ratio nb of job seekers/nb of UI benefit recipients	1513.49	1530.13	90.58	13623.67
– Relative to canton				
U-rate cant Unemployment rate in canton in 1998	3.73	1.20	0.82	6.34
Tertiary cant Part of job seekers in tertiary sector by canton	0.69	0.07	0.55	0.83
Women cant Part of woman in labour force by canton	0.41	0.01	0.38	0.43
Part-time cant Part of part-time workers by canton	0.26	0.03	0.18	0.30
Foreign cant Part of foreign workers by canton	0.24	0.08	0.13	0.46
Cross-border cant Part of cross-border commuters by canton	0.03	0.05	0	0.19
Vacancy cant Ratio nb of vacant job places/nb of registered unemployed by canton	0.11	0.07	0.05	0.32

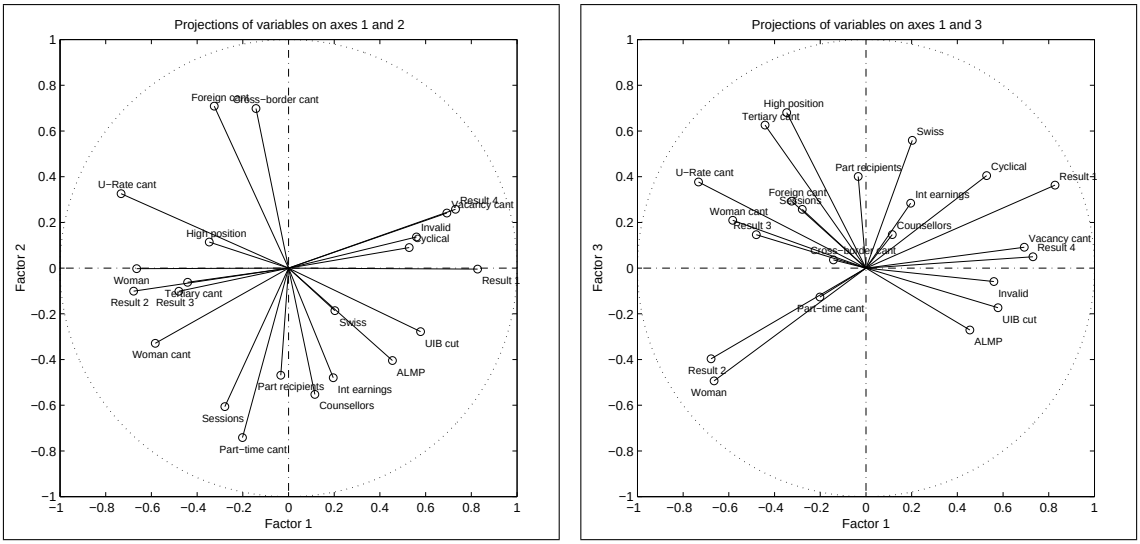

Figure 4: Principal Component Analysis: projections of the analysed variables on the factorial axes 1 and 2 (left panel) and 1 and 3 (right panel). All variables except those relative to cantons were normalised by the number of UI benefit recipients registered in REO

Table A2: Tobit estimates for the efficiency score differentials related to the use of counselling sessions

Variable	Coef.	St.Dev.	t-stat
Invalid	1.386	0.597	2.319
Permit O	7.479	2.578	2.901
Permit B	−0.327	0.145	−2.253
Women cant	−0.887	0.510	−1.739
Foreign cant	1.243	0.206	6.026
Tertiary cant	−0.421	0.102	−4.103
Cross-border cant	−1.086	0.278	−3.899
Part-time cant	3.185	0.413	7.710
Constant	−0.389	0.199	−1.956
Log$L$		-116.913	
Pseudo R-square		0.429	
Standard error		0.061	

Source: 132 Regional Employment Offices. Own estimation.
Note: 32 left-censored observations at 0.

Table A3: Tobit estimates for the efficiency score differentials related to the use of intermediate earnings

Variable	Coef.	St.Dev.	t-stat
High position	−0.171	0.060	−2.825
Permit A	−0.606	0.352	−1.720
Cross-border cant	−0.477	0.153	−3.101
Part-time cant	1.069	0.328	3.259
Vacancy cant	0.428	0.135	3.158
U-rate cant	0.036	0.007	5.015
Constant	−0.324	0.105	−3.073
Log$L$		-73.192	
Pseudo R-square		0.312	
Standard error		0.062	

Source: 132 Regional Employment Offices. Own estimation.
Note: 53 left-censored observations at 0.

Table A4: Tobit estimates for the efficiency score differentials related to the use of active measures

Variable	Coef.	St.Dev.	t-stat
High position	−0.329	0.080	−4.106
Permit A	0.755	0.406	1.859
Permit O	9.714	3.015	3.222
Cross-border cant	−0.312	0.169	−1.838
Constant	0.152	0.044	3.423
Log$L$		-41.490	
Pseudo R-square		0.783	
Standard error		0.073	

Source: 132 Regional Employment Offices. Own estimation.
Note: 67 left-censored observations at 0.