Labour market dynamics from a regional perspective
The multi-account system

Anette Haas, Thomas Rothe

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Abstract

In the last years the analysis of flow figures turned out to highly informative for labour market research and policy advice. Among researchers it is a well known fact that cross-sectional information about labour market is not sufficient to understand ungoing development. A pure sequence of employment and unemployment figures would hide the turnover in the market. Here we follow the useful analytical framework of transitional labour markets dealing centrally with flow figures. By developing the multi-account system (MAS) we go some steps ahead compared to indicators like job and labour turnover rates. First we combine the information of administrative data of the micro level with macro data containing pupils, self employed, retired persons. Embedded in an external framework, which is given by demography (birth, death, moving in and out), the MAS describes the transition process of the labour market on the regional level and contains all 180 local employment agencies in Germany. The multi-account system thus serves as a basis for strategically aligning each agency with the individual local situation of the labour market by explicitly taking into account the regional specifics. Thus it helps for future strategic decisions of active labour market policy. The creation of models for supporting regional monitoring and benchmarking is already far advanced and initial basic versions are tested in practice.

For estimating the unknown transitions of the data matrix we use a new algorithm the so called ADETON tool, which has the additional merit comparing to other entropy maximizing methods, that constraints can be formulated in a fuzzy way rather than exactly. Further we demonstrate on the basis of the agency Heilbronn some practice and numerical examples. Thus we present transitions into and out of unemployment and also from vocational training to employment.

We believe that the analytical potential of this instrument is not yet exhausted. In any event, it is already clear that the information content of this model by far exceeds that of a system of individual indicators. Details and relations of the regional labour market become apparent which show a high-resolution image of possible obsolete structures or increasing labour market dynamics. The model thus gives clear hints as to the scope and limits of the active labour market policy.

1 Objectives of a multi-account system

The flow figures and their analysis are essential elements for labour market research and policy advisement. In order to explain the dynamics of labour market, the flows between different statuses of the labour market need to be considered (Schettkat 1992, 1996).

The analysis of the stocks alone is not sufficient to understand the dynamics of the labour market since there are considerable amounts of movements between unemployment and employment during the year. If one considers only the stocks then only the balance is measured and information about total amount of movements during the year would be lost (see Davis/Haltiwanger/Schuh 1996 or Rothe 2003). In many papers the sources of job creation and job destruction are analyzed by using flow figures of the labour market (see, for example Blanchard/Diamond 1992; Mortensen/Pissarides 1994; den Butter/van Gameren 2004, Stiglbauer et al. 2003). Information at firm level is used, to some extent for checking the variables which either affect the recruitment of workers or the connection of job and worker flows (Belzil 2000; Burgess/Lane/Stevens 2000). Empirical analyses – e.g. with IAB employment sample – show, that labor market flows are positive correlated with the business cycle (Erlinghagen/ Knuth 2002).That means on the one hand that employees are considered not to lose or leave voluntarily their jobs during a cyclical downturn. On the other hand unemployed persons have less opportunity to apply on job offers and finally occupy these vacancies.

Typically job and labour turnover rates are calculated as indicators for labour market dynamics in order to be used for international comparison. Therefore, international household panels are analyzed (e.g. European Household Panel, ECHP) to identify the important transitions among employment, unemployment, non-employment (Kruppe 2002, 2003). Thus following Schmid/Gazier (2002) this concept of transitional labour markets is a useful analytical framework which deals centrally with flows of the labour market.

Some researchers use macro data for estimating a national accounting system to avoid problems with panel data sets (e.g. Reyher/Bach (1980) referring to Germany, Sheldon/Theiss (1995) for Switzerland; Broersma/ den Butter/Kock (1998, 2000) for the Netherlands). Some studies follow-

ing the tradition of Davis/Haltiwanger/Schuh (1996), in which only changes between two points of time are considered in stead of multiple changes of statuses in between, the labour market flows are underestimated (Broersma/den Butter/Kock 1998).

By developing the multi account system (MAS) our team[1] goes two steps ahead. First we combine the information of administrative data of the micro level with macro data containing pupils, self employed, retired persons, since this information is not available on micro level. Embedded in an external framework, which is given by demography (birth, death, moving in and out), the MAS describes the transition process of the labour market. Second the MAS operates on the regional level and contains disaggregated information on the labour market areas of 180 local employment agencies in Germany, which are important actors on the labor market. Consequently this yields to a total account system for regional population and labour force. General object of MAS is to cover the important dynamics of the local labour market, to make regions comparable, and establish a basis for strategic decisions of active labour market policy.

2 The regional component of the MAS

Since the introduction of the Social Security Code III (SGB) at the beginning of 1998 local employment agencies in Germany have higher discretion concerning the strategy of active labour market policy. The so called "integration title" contains the main budget of a local employment agency which is distributed to various labour market programs. The background for this is the insight that regional specifics of the local labour market affect challenge and effectivity of labour market policy. Further there is dependence between the financial situation of the community and the options for labour market policy. Actually the focus lies on disparities between the old and new Federal States, although within there are great differences of economic performance. Also, if one controls for qualification, industry affiliation by analyzing employment growth, it remains a regional specific term, which could not be explained. Regional disparities concern-

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ing employment and unemployment are remarkably stable over time, so there is little evidence for convergence of regions or the converging process runs slowly (e.g. Möller 2001).

The creation of regional input output tables is an example of further development of models on the national level (e.g. Okuyama et al. 2002; Israilevich et al. 1997). Ramos 2003 shows that information about regional linkage of intermediate inputs and final products are fundamental comprehending generating clusters. Roberts (2003) studies differences between cities and periphery by analyzing disposable income by a social accounting system. This kind of study indicates that the information of indicators and multipliers at the regional level is limited. So the total amount of inflows and outflows at the regional level gives a clear picture of the local labour market.

We selected the local labour agency as regional unit, which represents the administrative level. This dimension has some advantages concerning the intention of the MAS. First the local labour agency is a sufficient small scale, to cover regional disparities. Second it is the same level at which labour market policy is applied. Therefore a comparison for different focuses by applying labour market programs is possible. The MAS also gives you the option for analyzing by a more aggregate level, like Regional Directorates (RD) or types of local employment agencies (e.g. Blien et al. 2004).

3 Functions and applications of the MAS

In addition to stock statistics, flow data on the transition between training, employment and (registered) unemployment[2] provide important information for the guidance and placement of unemployed persons and the control of the active labour market policy. Of particular interest are the flows into and out of unsubsidized and subsidized employment and unemployment. The multi-account system is an instrument to support the control

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[2] Here we use the definition of unemployment of Federal Employment Agency, which differs from ILO measure concept of unemployment. A person is unemployed if seeks for an employment subject to social insurance contribution at least 15 hours a week. Registration at the Employment agency is also required. But an unemployed person is allowed to work up to 15 hours a week without losing unemployment status.

exercised by the central office of the Federal Employment Agency, the Regional Directorates (RD) and the Local Employment Agencies (AA).

Depending on its form, the MAS can support the following functions:

- _Monitoring:_ – The MAS provides information on the starting situation (stock data) and the movements (flow data) that prevail in the regional labour market (i.e. at the level of the individual agency). In analogy to demographic and labour accounting, the entire population is represented in the model.

- _Benchmarking:_ – The MAS can be used at different aggregation levels. Obvious references for comparing individual regions (here employment agencies) are the state or Regional Directorates levels, or other agencies with similar labour market structures.

- _Ex post scenarios:_ – The form of labour market programs carried out by a region in the past is to be made transparent in its effects by the possibility of influencing individual accounts and transitions in a scenario calculation.

- _Projections:_ – Fundamental decisions for the future implementation of labour market policy measures are to be simulated under constant framework conditions and better planning of the effects in the sense of transitions and stock changes is to be achieved. It is planned that financial aspects may go into the calculations.

The multi-account system thus serves as a basis for strategically aligning each agency with the individual local situation of the labour market by explicitly taking into account the regional specifics. The creation of models for supporting regional monitoring and benchmarking is already far advanced and initial basic versions are tested in practice. The development of scenarios and projections at the level of the employment agencies is in the conceptual phase and will be extremely sophisticated with respect to both its contents and methods.

For some years the flow out of active labour market policy measures has been shown in the integration balances of the Federal Employment Agency.[3] This information is also available at the level of the employment

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[3] The results of the integration balances are published by the Federal Employment Agency (Bundesanstalt für Arbeit 2003).

agencies and could thus in principle be used for comparisons. In addition, the Federal Employment Agency publishes monthly the number of flows into and out of unemployment. Inevitably, a number of transitions are recorded inaccurately due to the quality of the information available to agency employees.[4] Nevertheless, in the case of transition into unemployment the source accounts are of particular importance since they are an important criterion for preventative planning.

The hierarchical depth of the MAS is principally variable and depends on the research question or the information needs of the employment agencies. The accounts introduced correspond to the classifications relevant in each case. The accounts can generally be divided into "close to the labour market" and "far from the labour market". For accounts close to the labour market a fine division is used (e.g. employees by economic sector), while for accounts far from the labour markets an aggregate representation is used (e.g. children before entering school and pensioners). The active labour market policy measures have been divided into four groups and can thus be easily interpreted without becoming too complex.

4 Structure and functionality

The MAS can be represented in a matrix structure. The accounts permitted in the MAS, i.e. status types of persons in the labour market, are shown in the rows for time point t_0 and in the columns, for time point t_{0+1}. The fields x_{ij} of the matrix show the transitions between the status types. The main diagonal of the matrix includes the persons who stay in a certain status (stayers).[5] Stocks b for t_0 and for t_{0+1} are shown as row and column sums of the matrix if only one transition per person is possible during the observation period. If there are several account changes per person and if

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[4] Analyses based on inflow and outflow statistics of the Federal Employment Agency show that about 20 per cent of transitions are only short-term interruptions of the registration status. Out of the remaining 6 million inflows of unemployed persons (and outflows to a similar extent), more than one third is attributed to the hidden labour force (Stille Reserve) and to non-employment (Rothe 2003). In addition to periods of education and extended disability, these accounts include schooling or in-school training, retirement and self-employment not notified to the employment agencies.

[5] The number of stayers decreases the more we differ between specific statuses. So the definition of "stayer" is specific to our requirements and includes moves we are not interested in (e.g. job-to-job movers without changing industry section).

all these transitions are to be accounted for in the matrix, the row or col-
umn sum will exceed the stocks of the respective year (cf. 4.1).

Table 1:   Structure of the MAS for a specific employment agency

	Status at t_{0+1} (target account)				Σ
Status at t_0 (source account)	x_{11}	x_{12}	.....	x_{1I}	b^r_1
	x_{21}	x_{22}	.....	x_{2I}	b^r_2
	x_{31}	x_{32}	.....	x_{3I}	b^r_3
	…				…
	x_{J1}	x_{J2}	.....	x_{JI}	b^r_J
Σ	b^c_1	b^c_2	.....	b^c_I	b^{rc}

A two-dimensional representation (as in Table 1) is possible for an em-
ployment agency, a Regional Directorate or for the Federal level. The ex-
amination of all employment agencies would be a third dimension of the
transition matrix and could be represented as individual layers. Transitions
from any status type in agency AA_x to any other status type in a different
agency AA_y occur and can in principle be modelled.

4.1 Type of flow recording

The MAS refers to defined time points (in this case the beginning and the
end of a year) and shows the stocks in the individual status types (ac-
counts) at these time points. The movements (flows) between the individ-
ual stocks, divided by accounts, can be represented in two different ways:
based on either a *person/point-in-time approach* or a *case/period-of-time
approach* (Sheldon and Theiss 1995). Which type of flow recording is pref-
erable depends mainly on the analytical problem.

Where the focus is on the development of persons divided by the different
status types, a *person/point-in-time approach* is appropriate. The states
at time points t_0 and t_{0+1} are compared and a transition is defined in each
case. If a person is in account A at time points t_0 and t_{0+1}, it is assumed
that no change has taken place. Not more than one transition per person
and year is examined, abstracting from changes during the year. "That
leads to an under-estimation of flows in any case were multiple transitions
have occurred, especially if a person has returned to the same labour
force status he/she had the year before" (Kruppe 2001). Such a
representation will suffice for some problems. Examples could be

tation will suffice for some problems. Examples could be education policy issues (e.g. which type of school does a primary pupil attend one year after completing fourth form?). Of course labour market policy questions are also possible (e.g. which employment status has an unemployed person after one year?), although in this case the German "Eingliederungsquoten" (proportions of persons in regular employment six months after completing a measure) and "Verbleibsquoten" (proportions of persons who are not registered unemployed six months after completing a measure) are suitable instruments which are already available at the regional level too and which are being refined by additional indicators from individual longitudinal data.

However, the person/point-in-time approach does not allow the identification and thus the analysis of active labour market policy measures taken during the year. This means that the objective of the MAS to represent movements in the regional labour market and develop a control instrument on this basis would inevitably be missed.

The obvious alternative is a _case/period-of-time approach_. This type of flow recording includes all transitions between the accounts occurring during the observation period. Several changes between the defined status types are possible between t_0 and t_{0+1} since the flows are listed in their entirety. In addition, it is possible to enter the stayers, i.e. those persons who have not left their account between t_0 and t_{0+1}, on the main diagonal of the matrix. A case/period-of-time approach therefore permits the total flows to exceed the stock if the stayers are included.

Since the MAS is to be used as a control instrument at the level of the employment agencies, it is the cases which remain the relevant quantity. A solution has to be found for each new case, independent of the transitions the individual had in the past. Therefore the _case/period-of-time_ variant is selected for the MAS, at the same time providing the stayer and the stock data at the beginning and at the end of the year. Additionally, a _person/point-in-time approach_ could be made available in a later version, although this would require the development of a separate system.

Both the _person/point-in-time approach_ and the _case/period-of-time approach_ make it necessary to estimate a consistent model (i.e. initial stock

+ inflows - outflows = final stock). The estimation procedure used for the MAS is ADETON that we describe in the following chapter.

5 Estimation of a consistent matrix using ADETON

A problem which frequently occurs at the regional level is that certain data are only available at a higher aggregation level. Additionally problems arise if data are correlated at the regional level. In the multi-account system, this concerns transitions which are not known from the individual data or other statistical sources. Also, there are situations where, although stock data exist, we are also interested in flow data. This means that a portion of the data matrix has to be estimated. A classical solution procedure for this is the RAS algorithm, which calculates a two-dimensional table on the basis of given row and column sums. Often additional information (apart from the marginal sums) is available, which may stem from different sources and which have different validity. The ENTROP procedure allows the integration of any linear combinations in a target function, as constraints that improve the efficiency of the estimation. The given values can also be entered as upper and lower limit values (cf. Blien and Graef 1991 and 1992). In this way, the problem of inconsistent information from different sources is at least partially circumvented. This problem would occur in the case of fixed bandwidths, which would prevent any possible solution. The basic idea of entropy optimization is to make optimum use of existing information transformed into constraints without defining a fixed structure. We estimate a new table which is similar as possible to a given basis table, but also follows the given constraints. If no information about the basis matrix is available, all states are considered equally probable (or improbable).

Admitting of fuzzy constraints has the advantage that in the case of inconsistent constraints, it is not necessary to adapt constraints until a solution exists. The requirements should only be met as closely as possible. For this purpose, we formulate a constraint distance as a weighted sum of the weighting factors, which dispenses with the need for bandwidth constraints.

Graef (2003) developed the so called ADETON tool for the Institute for Employment Research (IAB). This procedure used here has the additional

merit that constraints can be formulated in a fuzzy way rather than exactly.

$$\text{Chi}^2 = \Sigma_i \, \Sigma_j \, \frac{(p_{ij} - q_{ij})^2}{q_{ij}} \, , \quad \text{where} \quad p_{ij} = x_{ij}/N \tag{1}$$

Here, p_{ij} and q_{ij} are the elements of the flow matrix to be estimated and of the basis matrix. These elements are normalized by the table totals.

The generalization of ADETON should enable both "hard" constraints (i.e. equality and inequality constraints) for the matrix to be estimated and "weak" constraints, for which certain weights are specified. This procedure is described in more detail the following paragraphs in order to motivate the derivation of the target function (cf. Graef 2003).

Let there be m given constraints which either define an exact value for a cell or relate to certain related table fields. Let $T(x)$ be a table aggregate which can be understood as a function that allocates a weighted sum to a table $x = (x_k)$ and let t_k be known weighting factors. Let k describe the position of the cell in the table and let x_k describe the pertinent value.

$$T(x) = \sum_{k \in K} t_k \, x_k \tag{2}$$

The constraints can then be formulated as follows:
$$T(x) = b_j, \quad T(x) \geq b_j, \quad T(x) \leq b_j \quad oder \quad b_{j1} \leq T(x) \leq b_{j2}$$

Now the optimization task is to implement a projection in such a way as to ensure the greatest possible structural similarity to a certain base table $u = (u_k)$. This can be done by minimizing a structural distance of table x from base table u. The structural distance is defined as follows:

$$D_T(x, u) = \sum_{k \in K} w_k \, h\left(\frac{x_k}{u_k}\right) \tag{3}$$

where $h(.)$ is a strictly convex function with minimum 0 at $t = 1$ and w is the pertaining weighting factor.

The distance function can be specified using e.g. the chi-square function or the modified cross-entropy, which is particularly suitable here since the solution set is restricted to non-negative values.

$$D_T(x, u) = \sum_{k \in K} \left(x_k \ln\left(\frac{x_k}{u_k}\right) - x_k + u_k \right) \tag{4}$$

This function stems from stochastics, where cross-entropy is employed as a distance measure for discrete probability distributions.

Now let us return to the constraints. In order to use fuzzy constraints it is necessary to define a deviation, since although the constraints need not be adhered to strictly, the deviation from the given values should be as small as possible.

For this purpose, the following constraint distance is defined as a weighted sum:

$$D_R(x, b) = \sum_{j=1}^{m} w_j Q_j (T_j(x) - b_j) \tag{5}$$

where w_j are the weighting factors for the strictness with which the constraints are adhered to and Q_j are the distance functions for the individual constraints. Best suited are quadratic functions (e.g. $Q(t) = t^2$), as they best meet the properties of the structural distances described above.

Now the two elements are combined to form the target function. The table to be estimated should minimize the structural distance $D_T(x,u)$ to the base table u (cf. equations (4) and (5)) while at the same time keeping the constraint distance $D_R(x,u)$ small to ensure that the constraints are met as strictly as possible (cf. equation (6)). An additive combination yields the following (minimized) target function $Z(x)$ for projection under fuzzy constraints, which has to be minimized:

$$\min \ Z(x) = g_T \, D_T(x, u) + g_R \, D_R(x, u) \tag{6}$$

which means that we have to meet the competing targets of optimum representation of the structure of the base table and optimum representation of the constraints. The weighting of these two targets can be controlled by the users themselves, through the parameters g_T and g_R.

The target function of the optimization problem has thus been fully described. The multi-account model has also served as an application for further development of this method.

6 Data basis and data analysis

In order to estimate multi-account systems at the level of the employment agencies, it is necessary to create basis matrices for East and West Germany which are in turn based on a matrix for whole Germany. The data sources and the basic procedure of data analysis using individual data from the Federal Employment Agency and the employee database (BeH) are briefly explained in the following (see Appendix for a detailed list of accounts). Far more detailed data are available for Germany for districts or employment agencies. Where regional data cannot even be obtained from state statistical offices, Federal data need to be re-estimated to the employment agencies, taking into account the proportion in the whole population or the working population.

In a first step, we determine the stocks at the beginning and end of the year for population, schools and universities, civil servants, soldiers, judges, retired persons registered by the Federal Statistical Office. For theses groups we have no individual data from Federal Employment Agency. In some cases the total flows into and out of individual accounts can be derived from official statistics or other research results. There are births, deaths and migrations, school beginners and leavers, new on-the-job and off-the-job training contracts, new retirements, new self-employed and business terminations.

The stocks for all accounts mentioned above at 31st December of the monitoring year and the previous year and the total inflows and outflows between those points in time are recorded in a database at the level of the employment agencies. This information is included as constraints in the subsequent estimation of the matrix using ADETON.

In addition to these aggregated data, individual data from the Federal Employment Agency and the employment history (BeH) are available for the definition of the employment status (subject to social insurance contributions) of a person. Dependent employment is defined as unsubsidized employment subject to social insurance contributions without marginally employed persons (less than 15 hours a week) vocational training on the job, because we have separate accounts for these groups (for more details see appendix). This concerns all accounts, that relate to unemployment, programs for active labour market policy (second labour market), voca-

tional training. Concerning vocational training and dependent employment we differentiate between industry affiliation. All these accounts contain daily information by employer and the Local Employment agency.

A non-intersecting data set is created for each person so that status changes can be determined. In the case of parallel spells, only a single state is examined for each person. The "dominant" status or account is selected using a priority list agreed upon in the work team. Our criteria for the rank rule are appointed by content objective of the employment agencies combined with the priority for higher data quality. This yield to the fact that accounts associated with employment generally dominate unemployment and non-employment accounts. However, marginal employment ranks behind unemployment since unemployment may be accompanied by marginal employment. This rule ensures that unemployment is not interrupted by marginal employment. Accounts relating to the second labour market and subsidized types of employment have the highest priority (cf. Figure 1 and Appendix). A more precise analysis showed an implausible number of short spells for the "non-employment" status, so that gaps were filled with the respective low-priority account. A closer checkup yield to the result that too many short time spells belong to the status "nonemployment", thus we fill it up under certain requirements.[6]
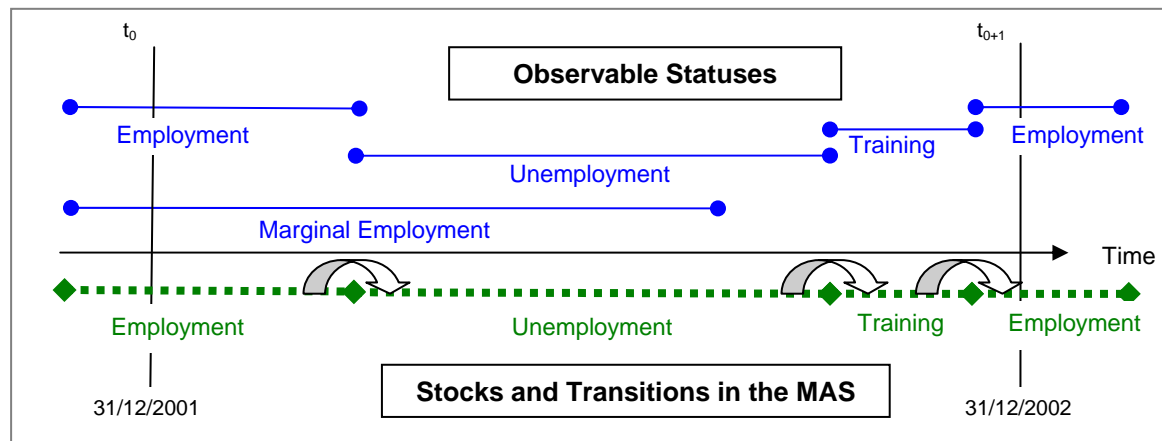
The stocks at 31 December can be determined directly. The stock of persons in the "non-employment" account, on the other hand, is a residual (from subtracting all other accounts from the population). The transitions are also subtracted from the resulting file, whereby each account change of a person is defined as a transition. This means, for example, that a direct change of employment (without unemployment) is registered in the MAS only if that change takes place across industry boundaries.[7] In the

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[6] We filled gaps up to 30 days. An exception was gap due to illness, which by definition is filled up to 42 days. For the remaining gaps in the data set, it was attempted to draw on reasons for outflow from the previous spell or reasons for inflow into the following spell. This made it possible to fill some of the unknown gaps, which may be the account preceding or following the gap. This procedure was chosen because it can be assumed that the times stated are more precise for higher-priority accounts. Our rule for non-intersecting data set and for dealing with gaps was tested for stability of results.

[7] A change of employment can be analyzed on the basis of individual data e.g. using the IAB Employment Sample (IABS). However, only changes concerning the defined ac-

framework of the case/period-of-time approach, all transitions are calculated separately by source and target account, and stored in a database in an aggregate form.

Figure 1:   Schematic representation of transitions of a person

Such analyses are also possible for employment agencies since the employment agency (for clients of the Federal Employment Agency) or the place of work (for non-clients) is recorded in each case. Moves across agency boundaries are then shown in addition, taking into account whether the employment status has changed due to the move.

Generally we could add further characteristics to the MAS such as age or sex. In this version we distinguish accounts in customer groups related to the local employment agencies. This feature informs about the chance of a person getting into employment and is result of a study of the Federal Employment Services[8].

Due to the necessity to integrate different data sources and the complexity of the estimation, the MAS is created with a delay of about two years. A delay of 18 months has to be considered for data from employment statistics since company reports often come in at the end of the year and changes are in many cases reported after one year. Nor are regional statistics relating to schooling and retirement created immediately.

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counts (e.g. changes of employment structure relating to industries) are interesting for the objective of the multi-account model, which adopts an aggregate approach.

[8] Currently the classification of customer groups is revised, so we use this concept only to demonstrate distinguishing different groups.

Largely automated data preparation and data storage in special databases facilitate data collection, but do not accelerate the process to a major extent.

As an alternative to the procedure used to far, small core multi-account systems are conceivable which would only represent that part of the labour market which is affected by unemployment or promoted using active labour market policy measures. As the respective data are prepared on the basis of the business statistics of the Federal Employment Agency, they would be available very rapidly, and estimations could be dispensed with since a high degree of validity could be assumed. On the other hand, such a reduction of the data basis would also mean a considerable reduction of the analysis possibilities.

7 Three application examples

In the following, the Heilbronn agency is used as a model to illustrate some elementary results and explain different forms to represent complete and partial transition matrices. The relatively fine division of some accounts increases both the information content and the complexity of the model. As the complete model is based on a table with 60 x 60 fields, it is of advantage to examine partial matrices separately.
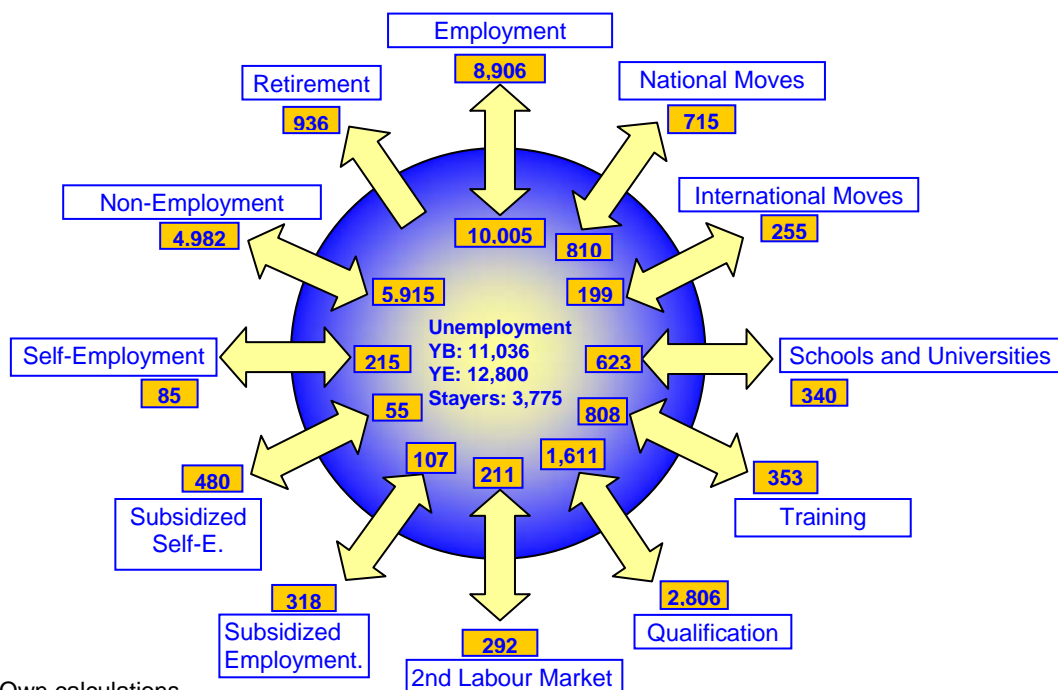
Although the variance over the time is an important application of the MAS, we concentrate on the transitions in 2002 and take a look at the flows in and out of unemployment – also in comparison with West Germany (7.1) and disaggregated by costumer groups (7.2). Finally we present the transitions from employment and the probability of changing from vocational training to employment differentiated by economic sector (7.3).

7.1 Transitions into and out of registered unemployment

A central problem, especially from the viewpoint of the employment agencies, is related to the transitions into and out of unemployment. From which status types do the unemployed come, and where do they go? The multi-account system for Heilbronn (2002), which is available in a first version, provides the values shown in Figure 2. This is somewhat more illustrative than the matrix table since the inflows and outflows are represented as arrows. The unemployment stocks at year beginning (YB) and

year end (YE) are shown at the centre of the circle. During the year 2002, unemployment in Heilbronn rose from 11,000 to 12,800. The increase in unemployment is due to two main sources: employment[9] and non-employment, while active labour market policy measures have the contrary effect.

Figure 2:   Transitions into and out of unemployment in the Heilbronn employment agency (2002)

Source: Own calculations

About one third of the unemployed was registered unemployed during the entire period (3,775 stayers) and therefore has to be counted among the long-term unemployed. The remaining 7,200 unemployed had changed into other accounts during the year. Since we count about 22,000 outflows from unemployment it's obvious that each person left unemployment three times on the average. So there is some evidence for transition-chains and high fluctuation between in and out of unemployment.

Now, although the absolute numbers shown in Figure 4 (which will not be discussed in more detail here) are to some extent informative, corre-
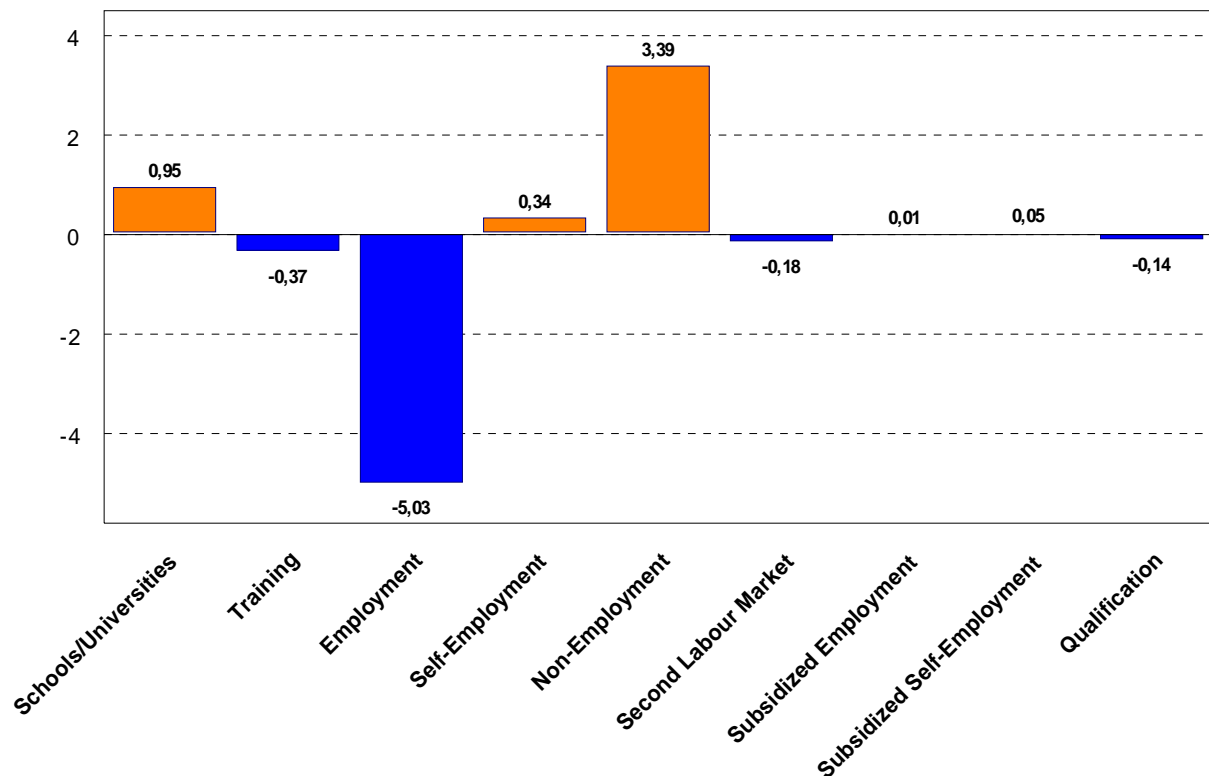
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[9]   For the purposes of Figures 2 and 3, employees subject to social insurance contributions (including persons doing military or alternative civilian service, marginally employed and civil servants including regular and professional soldiers) were summarized in the Employment account.

sponding reference values would be more descriptive. Such reference values are best obtained by comparing relative frequencies.

If we stay with the example above and ask whether the flows into unemployment in Heilbronn differed from the average for West Germany, we obtain a first benchmarking. For this purpose, the transitions from the individual accounts have to be divided by the total transitions into unemployment. If this is done both for Heilbronn and for West Germany, the results can in turn be related to each other.

Figure 3 is an impressive representation of the differences between Heilbronn and West Germany regarding flows into unemployment. Far more people became unemployed directly after school or university in Heilbronn than in West Germany. In addition, there were more flows into unemployment accounts from unsubsidized self-employment in Heilbronn. On the other hand, Heilbronn shows fewer transitions from on-the-job and off-the-job training and unsubsidized employment than other West German districts. Also, the flows into unemployment from the second labour market (mainly from employment-creating measures) were below average.

Figure 3: **Benchmark between Heilbronn and West Germany (2002), flows into unemployment from selected accounts. Deviation from West Germany in percentage point**

Bar chart showing deviations (in percentage points):
- Schools/Universities: 0,95
- Training: -0,37
- Employment: -5,03
- Self-Employment: 0,34
- Non-Employment: 3,39
- Second Labour Market: -0,18
- Subsidized Employment: 0,01
- Subsidized Self-Employment: 0,05
- Qualification: -0,14

Source: Own calculations.

Although these results may appear reliable, they should not be interpreted rashly. There are several good reasons to take a close look at the deviations in the flow into unemployment. In general, caution should be taken when interpreting relatively small absolute numbers. In our example, this concerns subsidized and unsubsidized self-employment, the second labour market and subsidized employment. Contrary to the use of indicators MAS allows for looking at absolute values considering basic parameters. For example transitions from schools and universities are strongly dependent on the number of secondary schools and universities located in the district of an employment agency.

Further the inflows from active labour market policy measures are largely determined by the use of instruments in the respective employment agency. Since relatively few employment-creating measures were taken in Heilbronn, it is natural that the proportion of flows into unemployment from the second labour market was lower than in West Germany.

By using the results from the multi-account system can also be calculated whether the number of employment-creating measures performed in Heilbronn was indeed below the average for West Germany. For this purpose, we compare the proportion of transitions from unemployment into the second labour market in Heilbronn with the corresponding proportion in West Germany. In the year 2002, 292 out of 22,106 outflows from unemployment went into the second labour market, which is about 1.3 per cent. In West Germany, the proportion was about 1.6 per cent (63,700 out of 3.96 million). Thus it turns out that the transition into employment-creating measures was also about 0.3 percentage point lower in Heilbronn than in West Germany.

All in all there are few accounts dominating the transitions in and out of unemployment (see Figure 2). Almost 70 per cent of all flows into unemployment come from employment or non-employment. In comparison to West Germany in Heilbronn the unemployed are often persons, which come immediately before out of employment. In contrast job to job transition works out without help from the local employment agency.

7.2 Distinguishing customer groups

We further differentiate four customer groups concerning the account "Unemployment". These costumer groups are the result of a study of the Federal Employment Agency using information of individual datasets about the age, state of health, qualification, unemployment duration etc. of unemployed persons. Further information concerning other important factors like dedication, reliability and additional verbal and soft skills could not be taken into account. As a matter of principle the placement officer is able to modify the customer group of an unemployed person if additional information (e.g. like the mentioned important factors) gives hints for a more appropriate classification. Even so the concept of building customer groups concerning the occupational career of unemployed persons is not without controversy.

The following example use the preliminary classification, which was calculated each end of the year. If a person quits the status unemployment before the end of a year, the person was sorted to account "customer group unknown".

Table 2: **Flows out of unemployment by costumer group in the local employment agency Heilbronn (2002)**

Flows out of unemployment Heilbronn 2002	Year-beginning stock	Target account						Total outflows	Year-end-stock
		employment		Non-employment		Qualification scheme			
	abs.	abs.	in %	abs.	in %	abs.	in %	abs.	abs.
Unemployment	11.036	8.906	40,3	4.982	22,5	2.806	12,7	22.106	12.800
Costumer group 1	6.155	6.241	47,3	2.547	19,3	1.976	15,0	13.189	7.980
Costumer group 2	1.891	1.195	28,9	1.272	30,8	389	9,4	4.132	2.088
Costumer group 3	979	451	25,9	391	22,5	250	14,4	1.740	1.022
Costumer group 4	2.009	427	20,2	547	25,9	181	8,6	2.110	1.708
Costumer group ?	2	593	63,3	226	24,1	9	0,9	936	2

Source: Own calculations.

This table shows that the probability for the transition from unemployment to employment is pretty unequal concerning the different customer groups. Surprisingly persons belonging to customer group 1 (high individual employment probability) are supported by qualification schemes higher-than-average. Here we abstained from presenting another benchmark between Heilbronn and Western Germany. But worth mentioning is the high proportion of transitions to unemployment in Heilbronn compared to West Germany (West 17.8%). The customer groups could be used to prove if the labour market schemes obtained the defined target groups adequately.

7.3 From vocational training to employment

The examples given so far, which have been restricted to flows into and out of unemployment, have already shown that the movements of employees are of particular importance for the regional labour market. Therefore we will now focus on dependent employees. A more detailed division into six economic sectors is available for this account.

First, we will examine the number of flows into and out of the individual economic sectors in Heilbronn during the year 2002. Next, we will calculate the probability of changing from an on-the-job or off-the-job training into employment in the same economic sector.

Table 3 shows a section of the MAS for Heilbronn (2002). Differences become apparent if we only look at the numbers of stayers (dark fields on

the main diagonal of the matrix) and relate these to the stocks in the indi-
vidual economic sectors at the beginning of the year. While merely 71.3
per cent of persons employed in agriculture and forestry (947 out of
1,328) worked within their economic sector during the entire year 2002,
the proportion was about 87 per cent in the manufacturing sector.

**Table 3:   Stocks and flows into and out of dependent employment in the
              Heilbronn employment agency (2002)**

Dependent employment in Heilbronn (2002)	Year-beginning stock	Target account							Total out-flows	Year-end stock
		SEC1	SEC2	SEC3	SEC4	SEC5	SEC6	SEC?		
1. Agriculture, forestry and fishing	1,328	947	24	15	57	9	13	18	629	1,272
2. Manufacturing	63,267	13	54,938	60	367	272	136	29	8,829	61,851
3. Construction	8,163	10	88	5,625	67	57	24	41	3,132	7,208
4. Trade and transport	32,949	20	358	60	24,911	534	267	16	10,313	30,952
5. Financial, renting and business service activities	19,172	19	377	69	460	14,402	172	6	7,076	18,888
6. Other service activities	23,697	14	152	20	221	108	19,692	6	6,341	23,662
? Sector unknown	2,057	0	6	0	0	0	0	1,616	2,656	3,532
Total inflows		573	7,413	2,177	8,316	6,792	6,306	4,131		

Source: Own calculations. For details on the economic sectors, see the Appendix.

The consistency of the matrix can be exemplified by the trade and trans-
port sector. If we add the inflows to the year-beginning stock and subtract
the outflows, we obtain the year-end stock (32,949 + 8,316 – 10,313 =
30,952).

The employment structure was on the whole relatively stable. 81 per cent
of all dependent employees (122,000 out of 150,000) stayed in the same
economic sector. Out of the persons who left their accounts between 8 per
cent (for other service activities) and 22 per cent (for agriculture) changed
into employment in a different sector. The remaining changes were made
into other accounts such as unemployment, marginal employment, self-
employment or retirement. These transitions too would raise a number of
questions, which could relate to the past, the future or could concern
comparisons with other regions.

Finally, we will examine the chances for trainees to be employed in the same economic sector after completion of their training. For this purpose, we calculate the transition rates into dependent employment (cf. Table 4).

Table 4: **Stocks and transitions from on-the-job and off-the-job training into dependent employment in the Heilbronn employment agency in per cent (2002)**

Heilbronn (2002)	Year-beginning stock	Transitions into dependent employment in per cent							Total outflows	Year-end stock
		SEC1	SEC2	SEC3	SEC4	SEC5	SEC6	SEC?		
1. Agriculture and forestry	113	**31.4**	0.7	0.8	2.4	1.6	1.6	12.3	86	88
2. Manufacturing	3,652	0.1	**67.0**	0.2	5.3	1.5	0.7	1.7	1,227	3,675
3. Construction	730	0.2	1.9	**28.7**	1.4	3.5	1.3	3.7	446	565
4. Trade and transport	2,484	0.2	1.7	0.3	**44.7**	2.1	0.7	2.6	1,065	2,330
5. Financial, renting and business service activities	1,355	0.2	1.5	0.3	5.6	**53.9**	1.7	1.6	519	1,303
6. Other service activities	2,143	0.2	5.4	0.6	2.9	1.1	**34.8**	2.3	988	2,095
Sector unknown	169	0.2	0.8	0.3	1.7	1.4	1.7	9.6	480	184

Source: Own calculations. For details on the economic sectors, see the Appendix.

For the purposes of this representation, the transitions into employment were calculated as a proportion of all outflows from training in the respective economic sector and can thus be interpreted as transition probabilities. The probability of obtaining work in the same economic sector after vocational training was 67 per cent in the manufacturing sector, i.e. more than twice as high as in the agriculture or construction sector. Similar prospects were offered in trade and transport as well as in financial, renting and business service activities. In "other service activities" the transition rate was surprisingly low (34.8 per cent). The MAS allows us to take a closer look at this specific sector. We calculate the transition rate in unemployment of 14% which is quite average compared to other sectors. But in many cases there are transitions in additional vocational training (4%) or university studies (6%). Further we found out that trainees are more mobile than in other sectors, because 14% of them moved into another region.

The examples presented here served to underline the particular usefulness of the multi-account system for regional problems and to illustrate some

ways to represent results. These analyses could be deepened and extended in many respects, which will not be pursued here.

8 Results and implication of the system

The multi-account system is an instrument for the analysis of regional labour markets in Germany that can be used by the employment agencies to solve various practical problems. Different available aggregated data sets and published results were prepared and combined with counts from recent individual data sets of the Federal Employment Agency in order to take account of the complexity of the matter concerned. The form of preparation makes optimum use of the information from the data sources and includes the individual degree of validity of the data in the estimation of unknown transitions. The different ways to represent results and focus on subaccounts create a high level of transparency in the complex area of regional labour markets. Depending on the focus of the analysis, it is possible to choose different reference points for comparisons (old or new Federal states or agencies of the same reference type). We believe that the analytical potential of this instrument is not yet exhausted. In any event, it is already clear that the information content of this model by far exceeds that of a system of individual indicators. Details and relations of the regional labour market become apparent which show a high-resolution image of possible decrepit structures or increasing labour market dynamics. The system thus gives clear hints as to the scope and limits of the active labour market policy.

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Appendix

Division of economic sectors for employment subject to social insurance contributions and on-the-job/off-the-job training

MAS Code	Sector	Description
1	A B	Agriculture and forestry Fishing, operation of fish hatcheries and fish farms
2	C D E	Mining Manufacturing Electricity, gas and water supply
3	F	Construction
4	G H I	Trade Hotels and restaurants Transport, storage and communication
5	J K	Financial intermediation Real estate
6	L M N O P	Public administration and defence Education Health and social work Other service activities Private households with employed persons
9	-	Other, unclassifiable

Priorization of the MAS accounts for individual data and employment history (BeH)

Priority	Account designation	Account Code	Description of sub-accounts
1	Second labour market	1400	4 customer groups
2	Subsidized employment	1500	4 customer groups
3	Subsidized self-employment	1600	4 customer groups
4	Qualification through training and continuing training	1700	4 customer groups
5	Employed persons subject to social insurance contributions, persons doing military or alternative civilian service (excluding marginal and subsidized employees)	0710 to 0790	Divided into 6 economic sectors
6	Officers and civil servants, regular and professional soldiers	0900	
7	Trainees (on the job/off the job/in school)	0600 0610 to 0690	In-school training Divided into 6 economic sectors
8	Unemployed	1200	4 customer groups
9	Self-employed and unpaid family workers	1000	
10	Marginally employed persons including practical trainees and working students	0800	4 customer groups
11	General education schools/ universities	0511 0512 0513 0524 0525	~ Extended elementary schools (Hauptschule) ~ Secondary modern schools (Realschule) ~ Grammar schools (Gymnasium) ~ Technical colleges (Fachhochschule) Universities

12	Retirements	1810 1820 1830 1840	Retirements (Rente) Part-time retirements Early retirements Retirements (Pension)
13	Job seekers	1300	
14	Non-employed persons	1100	
15	Moves	1910-1930 2010-2030	Moves out Moves in

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