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Formula allocation: The regional allocation of budgetary funds for measures of active labour market policy in Germany

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Summary:
A common problem of regional policy is the distribution of funds to regional units. To follow the specific purpose of this budgeting process in a rational way this is commonly done in a formula allocation. In the paper this is shown with the example of funds for active labour market policy.

In Germany, measures of active labour market policy – e.g. training measures and job creation schemes – are paid from a common budget. For the allocation of these budgetary funds (amounting to € 13 billion every year) to the regions of the Federal Republic of Germany, a formula was developed which was to be based essentially on a labour market indicator.

The criteria for the development of a formula allocation were: most accurate fit to the legal guidelines of the Social Code, transparency of the procedure, openness for necessary policy decisions, scientific correctness in implementation, efficiency of the whole process. Here the procedure used in constructing the distribution process is explained and the distribution result is set out. Both was finally passed by the Executive Board of the Federal Employment Services in Germany.

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1. Introduction

This paper treats a problem that is of a familiar nature in many contexts (see the articles in the Journal of Official Statistics no 18/3, e.g. Downes, Pogue 2002): The distribution of a fixed budgetary funds to a number of regional units. To follow the specific purpose of this budgeting process in a rational way this is commonly done in a formula allocation. The specific structure of the formula depends on the purpose, but there is the additional requirement to transfer this into a formal structure that is correctly specified. The criteria for the development of the method are: most accurate fit to the aim of the policy and to general legal guidelines, transparency of the procedure, openness for necessary policy decisions, scientific correctness in implementation, efficiency of the whole process. It is necessary to open the scientific discussion over the degree to which the formula allocations implemented in the policy process corresponds to these requirements.

The example we concentrate on is the distribution of money for the purposes of labour market policy in Germany, which amounts to a sum of about 13 billion € every year. A special method was developed in 1997/8 and has been used every year since 1998. During this time the method has changed slightly, but because the experiences with its application has been promising, the method is described here. In 2004 the allocation scheme will be assessed again by the Board of the Federal Employment Services in Germany (Blien 1998). The results of a scientific debate about the rationality of the allocation process can be used in a revision of the method.

Since 1.1.98 there has been only one budget title for the main instruments of labour market policy, the so-called integration title. It is left to the employment offices to decide how to distribute the funds among the individual types of measure. This is an important element of the regional responsibility in the control of labour market policy, which the legislator now prefers. In the Social Code IV the criteria according to which the funds are to be distributed are already stipulated relatively precisely. In § 71b(2) it says: "*When allocating the funds, in particular the regional development of employment, the demand for labour, the type and extent of unemployment* as well as the particular expenditure development in the preceding financial year *are to be taken into account*." (italics added by the author).

2. Basic decisions regarding the allocation process

The regional units the allocation process refers to are the 182 administrative units of the single employment offices (labour market regions, "Arbeitsamtsbezirke"). But the distribution is done in three steps not directly in one. In the first step the budget is split between western and eastern Germany. Since in the East the labour market situation is still very bad and especially very different form the one in the West a fixed proportion of currently 48,5 % of the budget is allocated to the regions of eastern Germany – far more than the proportion of the population. Then, in the next step the budget is distributed among 12 (8 in the East, 4 in the West) large regions (the "Landesarbeitsamtsbezirke"), separately in the East and in the West. This is done by the formula described in the following. Finally, by applying the same procedure as in the second step, the budget is allocated to single

labour market regions, within each large region. For brevity, we concentrate here on the second step.

Four indicator components were used in the formation of the *total indicator* which is the basis for the distribution formula. Each indicator component operationalises a dimension of the criteria which are decisive in the allocation of funds according to the Social Code IV. The four indicator components are

- Rate of change of employment
- Rate of underemployment
- Rate of unemployed with special labour market problems
- Outflows from unemployment into regular employment

The definitions of the single indicator components are:

1. *Rate of change of employment* calculated for two years. This indicator using data from the quarterly record of the employment statistics which includes all employment subject to social security contributions was 'easy' to define and to realise, since the legal provision could be converted directly into operational terms. In order to obtain the same 'direction' as the other indicator components, the sign of the rate of change of employment was changed.

Studies have shown that this indicator component demonstrates relatively unstable behaviour, as in a relatively short time considerable shifts can occur between the regions in the rate of change of employment subject to social security contributions. The individual Employment Service Regions are affected to differing degrees by cyclical effects depending on the strength and time of their occurrence. Therefore a two-year period is now used for the calculation of this indicator to smooth up abrupt changes.

2. *Forecast rate of underemployment,* made up of the forecast unemployment rate and the participants in relevant labour market policy measures. By using the measures, part of the underemployment in the particular region is absorbed and open unemployment is prevented. For this reason structural adjustment measures, job creation measures and full-time training measures were also included. The regional values for the measures and unemployment are shown in Table 1.

3. Rate of unemployed with special labour market problems. Here people are counted, who are long-term unemployed. In addition - among the unemployed - disabled people, elderly (above the year of 55), not formally qualified people and those, who came recently back to the labour market are included. All persons are counted only once, even if they have more than one of the mentioned attributes. The number of these people belonging to the these groups is weighted by the denominator of the underemployment rate.

4. Outflows from unemployment into regular employment in order to take into consideration the demand for labour or the capacity of the labour market to absorb workers. This indicator does not measure the problem situation of the labour market and thus portrays a different dimension of the

chosen total indicator. The inclusion of this dimension can be explained by the incorporation of funds for training measures into the integration title. The budget for active labour market policy should be spent where there are good prospects for success.

One problem of this indicator component is that seasonal fluctuations are reflected especially strongly in the outflows. In order to avoid regions with high proportions of seasonal employment, in other words with large proportions of the tourism and building industries, being reflected disproportionately and undesirably in the indicator values, the month of June was used for calculating the indicator values, as this month is not particularly affected by seasonal fluctuations. Solely for reasons of clarity, the values were multiplied by the factor 12. As the regional proportions do not change as a result of this transformation, the further calculations are not affected.

When determining the values for the outflow indicator, transfers into job creation schemes or structural adjustment measures were not taken into account since this does not signalise the desired type of capacity of the labour market to absorb workers.

The data required for the four indicator components were made available by the statistics department of the Federal Employment Service in the state desired as regards currentness and demarcation. After completing the calculations, the basis data (here included in Tables 1 and 2) were additionally checked once again by the sections responsible. In this way it was possible to guarantee that solely the correct "official" data from the Federal Employment Service were used.

3. Basic concept used in the construction of the formula

The procedure adopted for the construction of a formula to be used for the distribution of the funds of the discretionary payments for active employment promotion is to be described briefly in the following, before the formally exact calculation is presented in the next section.

The *distribution formula is based on a total labour market indicator* which combines the four indicator components discussed earlier. Table 1 contains the basic data for all four of the indicator components which are to be used in constructing the total indicator, and provides an overview of the definition of the individual indicator components. The underemployment rate, which is one of the relevant indicator components, is in turn made up of different components, which are shown in more detail in Table 1.

Table 1

Basic indicator components

in percent

Calculation for budget year of 2002

Region (Landesarbeitsamt)	Rate of . change of employment (2 years))	Rate of underployment -	Rate of special groups of unemployed	Rate of outflow from unemployment into employm.	Reference Quantity(region Size: number of people)
Schleswig-Holstein-Hamburg	1,7491	10,347	6,906	6,921	2011746
Niedersachsen- Bremen	1,8769	11,618	7,947	6,699	3850096
Nordrhein-Westfalen	1,4745	9,836	7,683	4,894	8097487
Hessen	1,9354	7,404	5,848	4,766	2754019
Rheinland-Pfalz-Saarland	1,5210	8,098	6,220	5,300	2268134
Baden-Wuerttemberg	1,8271	5,375	4,337	4,127	4859776
Bayern	2,1511	6,166	4,391	5,423	5609961
Westberlin	0,8209	20,411	12,757	6,830	944062
Western Germany	1,7553	8,684	6,405	5,310	30395281
Mecklenburg-Vorpommern	-1,2874	24,806	11,970	11,931	872815
Berlin-Brandenburg (o. Westberlin)	-1,6083	22,769	11,853	9,939	1869083
Sachsen-Anhalt-Thueringen	-1,7644	24,162	12,000	10,796	2486495
Sachsen	-1,4383	23,897	12,061	10,455	2133872
Eastern Germany	-1,5723	23,808	11,977	10,614	7362266

Definition Indicators:

Rate of change of employment {(6/00-6/99)/6/99 + (6/99-6/98)/6/98}/2

Underemployment rate (Unemployed(forecast 2002) + full-time training measures (FbW)+ structural adjustment measures(SAM) + job creation measures (ABM) (all 8/00-7/01)) / Reference quantity

Rate of spezial groups of unemployed: Long term unemployed., unemployed over 50, without formal qualifications, disabled und people who come back into the labour market. (8/00-7/01) / Reference quantity

Rate of outflow of unemployed into employment (without ABM, SAM 6/01) / Reference quantity * 12

Reference quantity: Dependent Workforce+ full-time training measures (FbW) + unemployed

Regions (Landesarbeitsamtsbezirke are divided between eastern and western Germany

The four indicator components “rate of change of employment subject to social security contributions” (with a reversed sign), “underemployment rate”, “rate of special groups of unemployed” and “rate of outflow from unemployment into employment” can not be combined simply e.g. by calculating the average. They have a different variation and a different range of values. If this effect is not controlled for, implicit weightings of the indicators will result. For this reason it is necessary to standardise the indicator components beforehand, i.e. they must be transformed in such a way that they show a mean value of 0 and a standard deviation of 1.

By means of the standardisation it is taken into account that the indicator components included show entirely different characteristics as regards their definition and their character. It is not possible to make a direct comparison of a growth rate, such as that for employment, and proportional values. Standardisation gives them a common basis.[2]

The standardised indicators could be combined by forming an average. In this way, however, the fixed variation of the indicator components of 1 would have to be reflected in the values of the total indicator. This would be an effect of the indicator construction and not one of the empirical reality. As one wishes to take into consideration the actual differences in the problem situations of the individual regions, the average of the standard deviations weighted by the particular mean values is calculated (this is the variation coefficient) and this value is carried over to the total indicator.

As all calculation operations are carried out separately for eastern and western Germany, the different variation of the labour market problems in the two parts of the country can also be reflected in the values of the total indicator. This is of some relevance since a look at the original values of the indicators in Table 2 shows that according to Employment Service Regions the labour market situation in eastern Germany is much more homogeneous than in the west.

The total indicator can then be used for the distribution of funds. The allocation scheme takes into account on the one hand the size of the region in question, and on the other hand the pressure of the problem situation. The choice of the weight of the two factors is a decision of regional labour policy; it does not result automatically from the procedure. A need for decisions also exists in another respect: the individual indicator components can be weighted differently.

4. Exact description of the allocation

In the following the formally exact description is given.

A total indicator G is formed by linking individual indicators E_i . The simplest procedures that can be applied here are multiplication and addition. A multiplication link has the peculiarity of giving extreme values a higher weight. As there is no cause for this in this case, addition is used as a linkage here. The total indicator G is determined as follows, when it is additionally taken into account that specific weights w_i are allocated to the individual indicators i, and r is an index for the regional unit in question.

$$G_r = \sum_i w_i \cdot E_{ir} \qquad (1)$$

[2] Similar rules are applied in many areas of life, for instance in sport. In the case of multi-discipline sports each performance in one individual discipline is given a score which is important for the overall result. Only in this way is it possible to compare results in metres for long-jump and times for running disciplines, e.g. in decathlon. This also applies for results in the same unit of measurement, as the variation of the results is important. If one were simply to add up the results of a 100-metre run and a 1500-metre run, the 100-metre specialist would be hopelessly at a disadvantage.

Prior to combination, the indicator components have to be standardised as they show different ranges of values and also the mean range of variation of the values resulting for them, i.e. their standard deviation, fluctuates. If no standardisation were carried out, indicators with a higher standard deviation σ_i would implicitly receive a higher weight. With the following formula for the standardisation, values are produced which show the mean value of zero and the standard deviation of one:

$$e_{ir} = \frac{E_{ir} - \overline{E}_i}{s_i} \qquad (2)$$

Here $\overline{E}_i$ denotes the national value for the particular indicator component and σ_i its standard deviation which is calculated according to the following formula in which R stands for the number of Employment Service Regions:

$$s_i = \sqrt{\sum_r^R B_r (E_{ir} - \overline{E}_i)^2} \qquad (3)$$

Here $B_r = b_r/\Sigma b_r$ which is denoted as "*reference proportion*" where b gives the absolute number of persons called the "*reference quantity*", which is formed as the sum of persons in dependent employment and participants in measures (cf. appendix Table 1). The reference quantity is therefore a measure for the size of the regions and is used as denominator in the calculation of the respective rates which serve as indicators.

The standard deviation and mean values are calculated separately for eastern and western Germany, since the labour market situation in the two parts of the country continues to differ greatly.

The above formulae differ from those usually found in text books on statistics only in that the national value is used instead of the arithmetical mean and that weightings are set according to the size of the region when calculating the standard deviation. One of the purposes of the precautions is for changes in the boundaries of a region to have as little effect as possible on the total indicator.

The standardisation produces indicator values with the standard deviation of one and thus obliterates the information contained in the original data about the variation of the problem situations. In order to avoid this effect it is appropriate to apply the average of the variations back to the indicators. However, the standard deviation can not be used for this as the original data have different mean values and ranges of values. Instead, it is advisable to use the variation coefficient V_i, which is the standard deviation weighted by the national value:

$$V_i = s_i / \overline{E}_i \qquad (4)$$

However, there are two problems which have to be considered here: the variation coefficient is only defined for values either greater than or smaller than zero. This is not always given, however, in the case of the rate of change of employment E_b. For this reason, only the variation coefficient of the other three indicators is used. Therefore, the indicator change of employment does not contribute to the included assessment of the deepness of regional disparities on labour markets.

Secondly, the application of the value of the variation coefficient to the standardised values can only be an approximation of the solution, since the standardised values show a mean value of zero. In spite of this restriction, the incorporation of an automatism for transferring the variation range of the empirical problem situations to the calculated indicator values is an important advantage of the selected procedure. If different weights for the indicators are taken into consideration, the following formula results for the total indicator GI:

$$GI_r = \frac{\sum_i w_i e_{ir}}{3} \cdot \sum_i V_i \qquad (5)$$

It must also be borne in mind that with the standardised indicators at first only a hierarchy for the individual regions is produced. Here, however, it is a matter of obtaining a *formula for the distribution of funds*. For this the total indicator must additionally be multiplied by a *measure) for the size of the region concerned*. If to this end, as would be appropriate, the relative number of workers (or the reference value) B_r is calculated, the distribution of funds can be given according to the following formula:

$$M_r = B_r + B_r \, GI_r \, S \qquad (6)$$

It can be seen that the proportion of the available funds that is given to a region is equal to two components which are linked by addition. The first simply gives the *"size" of the region concerned,* by means of which the funds are distributed solely according to the size of the region. The second component on the other hand, which is in turn made up of three factors multiplied together, gives the *pressure of the problems of the labour market situation*[3]. A global *control factor S* determines the relative weight of the two components. This factor can be set freely, if it is very small, the distribution of funds is determined almost solely by the relative size of the regions; if it is large, the problem situation on the particular labour markets, which is shown by the total indicator, comes through more strongly. It must be kept in mind that as a result of the standardisation the second component is negative for those regions which are in a comparatively good position. These regions are therefore allocated fewer funds than they would be entitled to according to their size.

Thus there remains only one final step in the process of constructing the indicator and its application for the allocation of funds: the sum $M = \Sigma_r M_r$ is only approximately equal to one, so that for the correction it is necessary to divide by this very total M. Then it results M' the *basic allocation quantity.*

[3] Since an indicator component for the capacity of the labour market to absorb workers is also incorporated into the overall indicator, the statement as to the "pressure of problems" is modified accordingly.

5. Discussion of the procedure chosen

The adopted procedure is intended to implement the intention of the legislator of the Social Act and to take into account formal aspects of the indicator construction in accordance with scientific standards, in order to produce a result that is adequate. In principle the funds could also be distributed following other procedures; the method selected here uses suitability as a criterion, not exclusivity.

The proposed procedure has, among other things, the advantage of simplicity; for example there is no need for multivariate methods, which would make it more difficult to explain the method to the decision-makers. This explanation of the method is necessary as there are still intervention possibilities and these are virtually revealed by the method. One of these intervention possibilities concerns the control quantity S, which can not be fixed in advance e. g. by a statistical criterion. The incorporated indicator components refer to different elements of economic reality; in order to interpret them it is necessary to have knowledge about labour market processes, which are not least substantiated theoretically. This must be reflected in the choice of the factor S.

What is ultimately behind the choice of the factor is a question as to the fundamental effects of labour market policy. Does it seem more favourable according to political purposes to employ measures more at the focal points of the labour market or is it better to distribute the funds more equally?

For the decision problem there was additional help in so far as that the variation of the total indicator was modified in such a way that is orientated towards the empirical variation of the indicator components. If one assumes that this variation reproduces the differences in the problem situations in a certain way, then an orientation quantity is provided here. According to the mathematical viewpoint, variation could also be taken into account by means of a modified control factor S', which includes the weighting by means of variation coefficients (in other words $S' = S(\Sigma_i V_i)/3$). This can be seen when equations (4) und (5) are used:

$$M_r = B_r + B_r \frac{\sum_i e_{ir}}{4} \cdot \frac{\sum_i V_i}{3} \cdot S = B_r \cdot (1 + \frac{S'}{4} \sum_i e_{ir}) \qquad (7)$$

When taking the variation into account, however, it is necessary to be aware that this is at variance with the standardisation, as the latter is based on the standardisation of the variation of the indicator components. For taking the variation into account, however, exactly this variation is used again which necessarily differs for the single indicator components.

The problem is ultimately inevitable as every procedure-related solution has to decide in the described sense between standardisation and maintaining the variation. For this reason the development of the indicator components should in future be carefully observed and if necessary the choice of the control parameter S should be adapted.

Finally it is necessary to point out that the permissible range of values for the control parameter has an upper limit. Formally the problem arises because the total indicator assumes negative values for regions with a comparatively favourable labour market situation. As can be seen from equation

(6), if $B_r < -B_r\, GI_r\, S$, the allocation of funds becomes negative from a certain point. In this case, which is reached when $S > -1/GI_{ro}$, individual regions r_o would not only receive no money, but would even have to submit funds. This is, of course, not a sensible result that hints at strong outliers and indicates that the factor S is not chosen sensibly. In many test calculations no such inadmissible effects for the distribution of funds occurred in the area of the values that were considered for the control factor.

Table 2

Total indicator constructed with four standardised indicator components
(budget year 2002)
Indicator components with equal weights, control factor S = 1,5

	1	2	3	4	5
	Reference quantity (%) B	basic allocation quantity (%) M'	Allocation of funds (Previous year 50%) M^X	Deviation from region size	Deviation from allocat. previous year
Regions				With respect to M'	
Schleswig-Holstein-Hamburg	6,62	8,37	8,18	26,47	3,19
Niedersachsen-Bremen	12,67	16,40	16,22	29,47	-0,47
Nordrhein-Westfalen	26,64	30,74	29.97	15,39	2,02
Hessen	9,06	7,27	7,74	-19,74	-9,47
Rheinland-Pfalz-Saarland	7,46	7,81	7,50	4,71	8,82
Baden-Wuerttemberg	15,99	9,88	10,48	-38,18	-5,85
Bayern	18,46	12,62	13,36	-31,63	-3,02
Westberlin	3,11	6,90	6,55	122,13	5,26
Western Germany	100,00	100,00	100,00	0,00	0,00
Mecklenburg-Vorpommern	11,86	12,11	12,59	2,19	-0,60
Berlin-Brandenburg (o Westberlin)	25,39	24,23	23,90	-4,58	-6,10
Sachsen-Anhalt-Thueringen	33,77	34,64	34,92	2,56	0,23
Sachsen	28,98	29,02	28,59	0,13	5,70
Eastern Germany	100,00	100,00	100,00	0,00	0,00
Deviation proportional allocation (West)*		27,46			
Deviation proportional allocation (East)*		2,32			

The last two lines show separately for East and West how much the allocation of funds deviates from an allocation according to the region size B (summed up over all regions)

6. The result

Table 2 shows the results of the allocation procedure for the budget year 2002. It was done according to a decision of the Board of the Federal Employment Services to use the procedure developed for the allocation of funds. This decision included further to use equal weights for all indicator components and to set the control factor S to 1,5. Later on it was decided to used the directly computed values of M' only with a global weight of 50 %. The other 50 % is the allocation of the previous year. This was done to smooth up the allocation of funds.

The last two columns of table 2 compare the distribution given by M' with the sizes of the region and with the M' of the previous year. The deviations A are calculated as
$A_r = (M'_r - B_r)/ B_r$. The deviations A are relatively small; this becomes clear in a summarising quantity D^x, which is contained in Table 2. The last lines of the table shows how much the generated distribution of funds differs from a proportional distribution. For this the absolute values of the differences between the first column of the table and the proportional values for the quantity B are simply added together with the column relevant for the distribution of funds; this is done separately for east and west. This is done in accordance with the following formula:
$D^x = \Sigma_r |B_r - M_r^x|$

The smallness of the values for D^x can be explained by the fact that also the second term in equation (6) includes the size of the region concerned B_r. Even if one wished to orientate oneself radically towards the problem situation and not towards proportionality when distributing the funds, an allocation of budgetary funds has to take into account the size of the region. The values for D^x differ for eastern and western Germany even when the same control factor S is used. This can be attributed to two characteristics of the selected indicator construction. Firstly the different values for the average variation coefficients $\overline{V}_{Ost}$ und $\overline{V}_{West}$ have an effect. Secondly the correlations between the indicator components affect the result. If they are high, then there are serious regional disparities, the values for the total indicator differ more considerably and the funds are redistributed to a greater extent. It is thus clear that the total indicator reflects such correlations.

The results obtained by the procedure described was afterwards used by the regional units of the Federal Employment Services (Landesarbeitsaemter) to allocate funds to the smaller units of local employment offices (Arbeitsamtsbezirke). The same procedure was applied respectively, whereas it was possible to use the options of weighting the indicator components differently and to chose a different control factor S.

7. Outlook

Since the beginning of 1998 the labour market policy funds have been distributed according to the method described. Meanwhile the law that regulates the working of the Federal Employment Services has been changed several times. Up to now only slight corrections of the formula for the allocation have been necessary (Blien 2002). But now there is a fundamental reform of labour market policy going on, including a complete reorganization of the Federal Employment Services. The budgeting process will be changed fundamentally. Therefore changes of the allocation process are

unavoidable. It is necessary to start the debate again, think about the integration of labour market and structural policy measures and about many other aspects.

In 2004 a new proposal of the allocation scheme will be assessed by the Board of the Federal Employment Services in Germany. The results of a scientific debate about the rationality of the allocation process can be used in a revision of the method.

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