INFORMATION SYSTEMS FOR REGIONAL LABOR MARKETS

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PREFACE

This Collaborative Paper aims at describing the main features of information systems for regional labor markets. The paper has been written in the context of a comparative study of regional information systems. This study has been carried out by the Regional Development Group of the International Institute for Applied Systems Analysis (IIASA) at Laxenburg in cooperation with the Department of Regional Economics at the Free University in Amsterdam. The paper has been presented at a workshop on Information Systems for Integrated Regional Development, IIASA, Laxenburg, December 15-17, 1982.

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1. INTRODUCTION

The situation on the labor market is an important aspect of socio-economic conditions. Obvious examples are: unemployment, wage levels and the quality of working conditions.

It is not surprising therefore, that national authorities have developed information systems for labor markets as a basis for an adequate socio-economic policy.

A major feature of the labor market is that it is segmented: it consists of a large number of submarkets which are more or less independent from each other. Submarkets may be distinguished among others, according to type of occupation (e.g., blue collar versus white collar) and region. Neglect of this segmentation leads to an inappropriate understanding of labor market phenomena. Therefore, distinctions of the type mentioned above should be reflected in information systems for the regional labor market.

In this paper we will especially discuss how the regional dimension has to be included in information systems for the labor market. Obviously, a properly regionalized information system would be of high importance for regional authorities. In addition to national and regional authorities, other groups of users, such as firms, labor unions and research institutions should be mentioned.

Information systems can be approached from the viewpoint of demand for and the supply of information. In the short run, the information which can be produced by such systems is determined by their structure and inputs, which means that the demand for information has to be adapted to the given supply. In the long run, the structure and inputs of information systems no longer need to be considered as given, however. In that case, one may develop systems so that they come to meet the requirements from the demand side. Obviously, somehow the urgency of additional wishes for information has to be traded-off against the additional costs of improving information systems.

In this paper we will use this distinction between demand and supply by first formulating desiderata for information systems after which the desiderata will be confronted with possibilities to come to meet these desiderata. This approach will be followed for the following subjects: the regionalization of labor markets (Section 2), the statistical data base (Section 3), and the use of impact and forecasting models in connection with regionalized information systems (Section 4).

2. CHOICE OF REGIONALIZATION

2.1 Regionalization: Desiderata

One of the first questions to be answered when developing a regional information system is what kind of regionalization one aims at. This may have far-reaching consequences for the spatial level at which data have to be collected. We will find that the appropriate regionalization to be used in a regional information system depends on the aims of the users (see e.g. Johnston, 1970).

Essentially, three types of regionalization principles can be distinguished (cf. Paelinck and Nijkamp, 1976):

- homogeneity with respect to one or more characteristics

- functionality with respect to internal spatial relationships
- administrative competence.

Each of these principles can be relevant in case of information systems for regional labor markets. Homogeneous regions, for example, are useful, when in the context of social welfare programs, regions have to be identified with a high level of unemployment. Functional regions, such as the standard metropolitan labor area (SMLA), are useful, among others when one wants to study the impacts of economic policy on regional labor markets. Administrative regions are the natural spatial unit for the corresponding regional authorities.

We conclude that a considerable flexibility is required from information systems so that they can produce information according to different regionalizations. It has to be added that ideally information systems cannot only produce information according to a prespecified regionalization, but that they can also produce new regionalizations according to certain rules to be specified.

Flexibility is also required with respect to regionalizations when the time dimension is introduced. The three regionalization principles mentioned above may give rise to changing partitionings of space in the course of time.

Consider for example the case of administrative regions. Although the borders of certain administrative regions may be fixed during long periods, the borders of other administrative regions may change considerably in the course of time. When these changes are not taken into account it may give rise to misleading results. For example, Norton (1979) has shown that the development pattern of urban population figures in the USA depends considerably on the extent to which annexations by urban centers of surrounding municipalities are taken into account or not. Another example can be given in the field of intermunicipal migration. In the Netherlands until recently no data were available on intramunicipal movements. Thus, intermunicipal movements had to serve as an indicator of overall residential mobility. In the course of time the number of municipalities decreased considerably due to fusions. This has a negative influence on the

volume of intermunicipal movements, which reduced the usefulness of the latter as an indicator of overall residential mobility. We refer to Peters (1982) for a systematic treatment of fusions and border corrections between the basic areal units of an information system.

Similar examples can be given for the other regionalization principles. An important issue concerns the development of functional urban areas (such as SMLA's). Clearly, in times of substantial socio-economic change, functional relationships in space will change as well, giving rise to continuously changing functional urban areas. Many discussions on the question whether urban development is now in a phase of desurbanization are obscured by the fact that it is not made clear whether functional urban areas are assumed to be fixed at certain historical borders or whether they are allowed to change in the course of time.

After having discussed the principles according to which regionalizations can be carried out, we will pay attention to the way in which such regionalizations can be arrived at in practice. The construction of regionalization can be achieved by clustering basic areal units (see Fisher, 1982).

Although clustering basic areal units gives rise to a certain loss of detail, it will lead to an improved understanding if carried out appropriately. This is reflected by Figure 1 (see also Hinloopen and Nijkamp, 1982).

Clustering methods are comparable with other multivariate methods such as factor analysis, in the sense that they can be used to represent the main features of a complex phenomenon by means of as little information as possible. Clustering may especially be useful when the spatial scale of the basic areal units differs considerably.

Many elements may be involved in such a clustering procedure:

1) The fixation of a maximum and minimum scale for clusters.

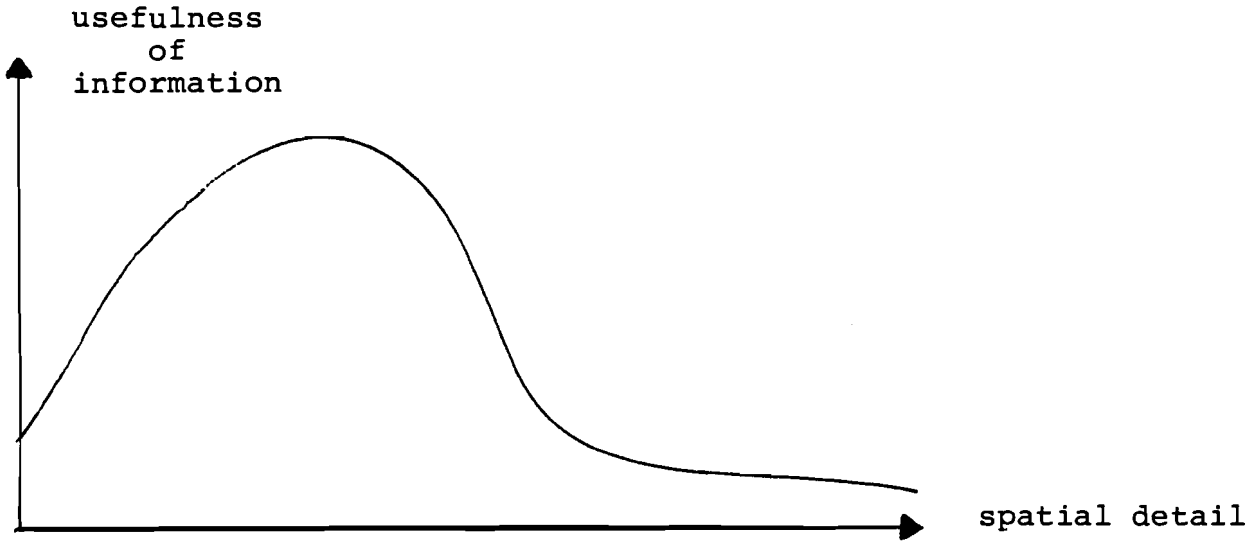

Figure 1. Relationship between spatial detail and usefulness of information.

2) The requirement that every areal unit in a cluster has at least one common border with another unit in that cluster (contiguity condition), if desired.

3) The requirement that each unit is a member of a cluster (exhaustiveness condition), if desired.

4) The requirement that each unit is a member of not more than one cluster (clusters should not be overlapping), if desired.

5) The choice of the regionalization principle (functionality versus homogeneity) and in connection with that, the choice of the variable(s) by means of which the functionality and homogeneity are to be measured.

6) The choice for a hierarchical or a non-hierarchical clustering procedure.

7) The choice of a clustering objective (for example: maximize mean internal cluster homogeneity).

It is clear from this list that once the regionalization principle has been formulated, there are still many choices to be made before finally a clustering can be carried out.

In recent years, in the sphere of spatial modeling, attention has been asked for the fact that the regionalization used may have definite effect on the modeling results (see e.g. Openshaw, 1978, and Baumann et al., 1982). It appears that the correlations between variables measured at a certain spatial level depend substantially on the spatial scale and the regionalization used. Therefore, the above mentioned authors conclude that the regionalization has to be determined simultaneously with the estimation of relationships between variables in which one is interested. The common practice is that these steps are made successively: first a regionalization is determined and after that one estimates the relationships one is interested in. The obvious consequence of the former approach is that each problem requires its own regionalization.

2.2 Regionalization: Practice

To which extent is it possible to come to meet the demand for information to be produced according to any required regionalization by means of information systems? Several factors may be mentioned which hamper the usefulness of regional information systems in this respect.

One factor is insufficiently developed software, so that information cannot be produced according to specific regionalizations. Obviously, this problem can be removed relatively easily by improving software. Also, computer programs to produce clusterings of areal units according to specific rules are well developed now so that they can in principle be included in regional information systems.

Another factor, which is much more difficult to remove, relates to the size of the basic areal unit on which data are collected. This size should be sufficiently small to make clusterings according to various purposes meaningful. When data are collected by sampling, the costs will increase considerably with the number of areal units distinguished. Therefore, one may expect a tendency that data collection by sampling with a high spatial detail only occurs at a low frequency. Another problem

which has to be mentioned in connection with a large number of small areal units is that one easily runs into troubles with statistical confidentiality (cf. Dalenius, 1977). In such a case information may be suppressed or be made public at a low level of detail, so that a trade-off arises between the spatial detail and the detail according to other points of view (e.g. sectoral detail). A final problem which has to be mentioned concerns interareal linkages such as commuting, migration and trade. Since the number of spatial interactions depends on the number of spatial units in a quadratic way, small spatial units may give rise to huge stocks of data to be collected and handled (cf. Coombes et al., 1980).

We conclude that a data base with a high regional detail can only be achieved at high costs, which obviously have to be traded off against the advantages of such a level of detail.

In practice one often will find a situation in which some data are available at a high spatial level (e.g. provinces) and other data at a low spatial level (e.g. municipalities). In such a case it is certainly not necessary to aggregate data of municipalities towards provinces before something meaningful can be done with them. A *multilevel* approach, in which different phenomena are dealt with at different spatial levels may prove to be fruitful. For example, similar to the central place theory according to which services are provided at different spatial levels, (developed by Christaller, 1935), it can be argued that the spatial extension of labor markets in some sectors may be much higher than in other sectors.

This argument in favor of a multilevel approach especially becomes clear when data bases for different policy fields such as labor market policies, economic policy and physical planning are to be used jointly. In such a case it can be argued that functional urban areas form the appropriate spatial units from the viewpoint of regional economic and labor market policy, whereas much smaller spatial units are necessary for physical planning (cf. Van Engelsdorp Gastelaars, 1981).

Our emphasis on flexibility with respect to the appropriate regionalization does not alter the fact that there is certainly a need for a *general purpose regionalization*, which comes to meet the information needs of the majority of the users. Such a general purpose regionalization may form an important means to achieve a standardization within the data base of one particular information system, and also to improve the integration of different information systems. Functional economic regions are a good candidate for such a regionalization. It is reasonable to require that a general purpose regionalization satisfies the contiguity, exhaustiveness and non-overlap conditions (see Section 2.1). A good way to give content to functionality is to construct regions such that internal commuting streams are high and interregional commuting is insignificant. As a result one arrives at approximately overlapping residential and working regions. In Section 2.1 we noted that spatial relationships may change over time so that the borders of the functional economic regions would have to be revised in the course of time. To avoid this problem as much as possible, it is advisable to construct regions which do not have to be revised frequently. Schuurmans (1981) makes the interesting suggestion to take into account interregional migration as an additional clustering criterion. Interregional migration is a phenomenon with a long time span. If a large part of residential mobility takes place within the functional regions, one may indeed expect that the delineation of these regions will not change much in the course of time.

The last part of this section will be devoted to a discussion of regionalizations used in regional labor market modeling. We will do this on the basis of a recent survey of multiregional economic modeling (see Issaev et al., 1982). The survey covers 50 operational multiregional economic models (40 of them including multiregional labor market submodels) from 20 countries. We found a very definite tendency towards the use of a general purpose regionalization consisting of administrative regions. Only in 2 or 3 cases researchers developed a special purpose regionalization based on the homogeneity principle. In four cases use was made of a general purpose regionalization based on the functionality principle.

These findings indicate that in general the regional detail in the data base is weak: model builders are forced to use general purpose regionalizations based on administrative regions. From the modeling point of view, functional regions should be preferred for most purposes. The insufficiency of regional detail can also be shown by the number of regions distinguished in the models: the median number of regions is equal to 9, which is not much.

Number of regions	Number of models
2 - 8	21
9 - 20	13
21 - 100	13
> 100	2
unknown	1

Table 1. Frequency distribution of the number of regions in multiregional economic models.

Table 1 reveals that although some models produce information on large numbers of regions, the large majority of the models only deal with a relatively small number of regions. Obviously, one should be careful when interpreting these results, since the models pertain to countries which vary strongly in size and population.

It is interesting to note that in some models a multilevel approach is used. In that case, economic and labor market phenomena are dealt with at a certain regional level after which urbanization and land use phenomena are taken into account at a lower regional level. For more details we refer to Rietveld (1982).

3. STATISTICAL DATA ON REGIONAL LABOR MARKETS

3.1 Statistical Data: Desiderata

In this section we will formulate desiderata for statistical data on regional labor markets. Desiderata may relate to several aspects of data:

- contents
- timely availability
- frequency of observation
- length of time series
- reliability
- regionalization (see Section 2)
- data collection (sampling versus integral observation)

We will first pay attention to the *contents* of a data system for regional labor markets. An important requirement concerning the contents is that the data should be *coherent*. Several dimensions can be distinguished in this respect.

1. For a time series of one particular variable, coherence means that observations in different points of time are comparable. Hence, no substantial changes in definitions, classifications, counting conventions, procedures to reduce observation errors, etc., may occur. Also changes in basic areal units should be mentioned here (see Section 2.1).

2. For a regional cross-section of one particular variable, coherence means that observations are comparable among regions according to the same viewpoints mentioned above. Problems may arise, for example in case of insufficient coordination between regional agencies active in the field of data collection and manipulation. Coherence may especially become problematic when regional data are collected from different countries.

3. For data on a set of variables, coherence means that in addition to the above requirements a standardization of classifications, and a synchronization are achieved among variables. Further, coherence of a data set means that no data on major variables are lacking. In general it can be stated that the larger the number of ad-hoc assumptions one needs when carrying out an analysis, the smaller the coherence of the pertaining data set.

For example, assume that one wants to compute regional unemployment rates, while data are available on regional unemployment volumes and the regional dependent labor force. In this case a problem arises since no information is available on the

regional independent labor force. An ad-hoc assumption is necessary to arrive at the desired result. If one knows the national independent labor force, the corresponding regional variable can be approximated by some kind of proportionality assumption, which has an ad-hoc character.

In the context of labor markets, coherence can be elaborated as follows: a coherent system of labor market data includes a complete description of labor supply (including unemployment) and labor demand (including vacancies). Concerning the persons and/or positions involved in supply and demand, data should be available on standardized classifications with respect to genus, age, nationality, education, occupation, economic sector, wage, number of hours worked, and qualitative aspects of labor conditions. Given the fact that we are dealing with *regional* labor markets, in addition, data should be available on the places of work and residence. Figure 2 gives a visual representation of demand and supply on the labor market (cf. CBS, 1977). It clearly indicates that there are two units of observation involved: persons and positions. In Section 3.2 we will discuss some of the problems arising from this fact.

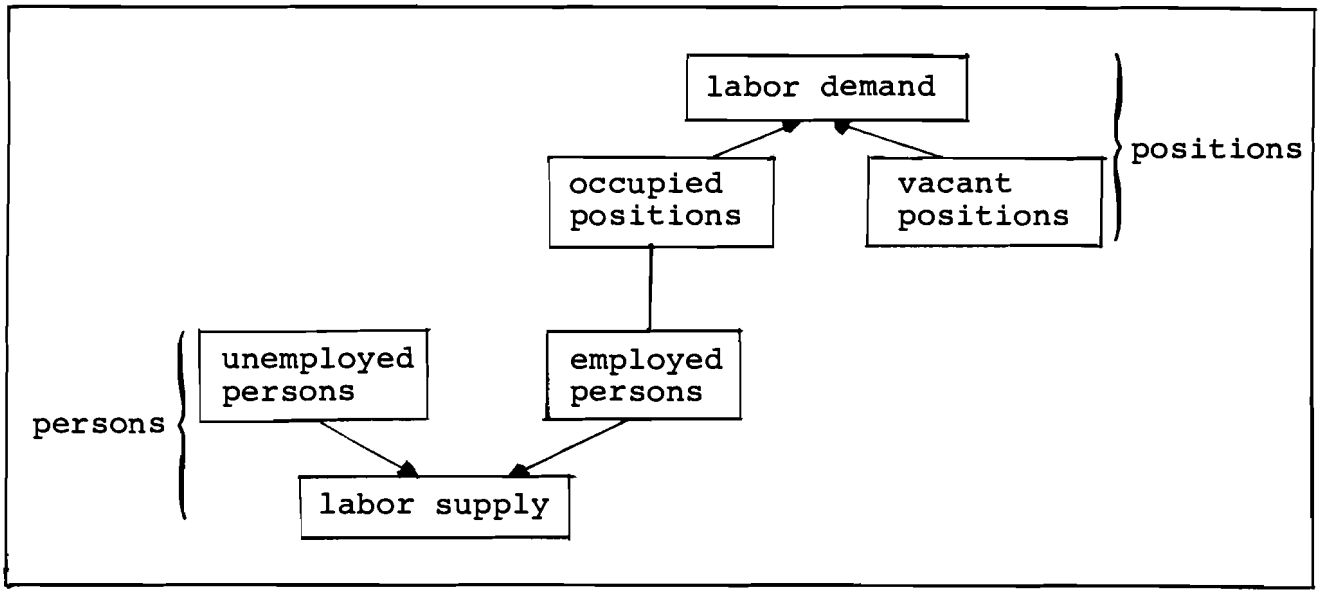

Figure 2. Supply and Demand on the Labor Market.

The type of information needed may change from time to time depending on the sometimes rapidly changing conditions on the labor market. The above list is a good starting point for most purposes. For special purposes, the classifications may have to be refined, or new items may be added. For example, in recent years there is a growing interest in informal, unpaid, "grey" and "black" activities on the labor market, which are usually not covered in labor market information systems.

For an appropriate understanding of the labor market, data on *stocks* such as employment and unemployment are clearly important. In addition, knowledge on *flows* is important for insight into the dynamics on the labor market. Examples of such flows are: the flows of persons entering and leaving the market, changing positions, becoming unemployed, moving from one region to the other, etc. (see also Heyke et al., 1975).

Labor markets are strongly influenced by demographic and economic (industrial) conditions, as well as by the structure of educational and social welfare systems. Therefore, attention should not only be paid to the *internal* coherence of a system of labor market data, but also to the *external* coherence with respect to other systems. Thus, ideally a standardization of data systems from various fields should be achieved. This means that in various data systems standardized classifications are used with respect to education, occupation, sector, region, etc.

As indicated at the beginning of this section, desiderata may not only be formulated with respect to the contents of data, but also with respect to other aspects. The urgency of these desiderata depends on the purpose for which one wants to use the data. In research there is a strong need of coherent data on time series of reasonable length and measured at a reasonable level of frequency. On the other hand, for policy making, coherence is not of prime interest. Here the need of recent data on some key variables is most urgent.

3.2 Statistical Data: Practice

When existing systems of labor market data are confronted with the desired features it immediately becomes clear that the desiderata are not met. Often, several elements of the desired data are missing or only weakly developed: data on vacancies, flows, qualitative aspects of labor conditions and (not surprisingly) informal labor. Also if data are available, usually coherence problems of several kinds occur. We will illustrate these difficulties by means of the Dutch labor market data system.

The Central Bureau of Statistics in the Netherlands has developed a labor market data system which consists of 40 components (see CBS, 1977). These components range from the census which is in principle carried out every 10 years to unemployment data which are produced monthly. The subjects covered in these components are described in Table 2. We note that a considerable

Table 2. Subjects of components of labor market data system

SUBJECT	NUMBER OF COMPONENTS
employment (total)	16
employment (particular sector)	18
unemployment	4
vacancies	2

number of components (34) relate to total employment and employment in particular sectors. In each of these components one or more of the following aspects of employment are covered: demographic variables, socio-economic variables, socio-psychological variables and flow variables (for example: commuting and migration).

The spatial detail varies among the components. In 10 cases data are collected at the national level: a regional disaggregation is not possible. It appears that a coherence problem is present as regards the regionalization used. In some components

a regionalization is used which is irreducible to regionalizations used in other components.

In the components of the data system most data refer to demographic and socio-economic variables. Data on flow-variables and on socio-psychological variables are rare.

The diversity among the components of the data system is represented by Table 3, in which the components are characterized by means of the following features: regional detail, frequency of observation, and number of variables covered. In the table we have included the components describing total employment, leaving out 5 components based on estimates or of irregular periodicity.

Table 3. Features of components of labor market data system

	SPATIAL UNIT	PERIODICITY	NUMBER OF VARIABLES COVERED
A	municipality	10 years	18
B	municipality	10 years	6
C	municipality	6 months	4
D	county	2 years	21
E	province	3 years	10
F	province	6 months	11
G	province	1 month	3
H	nation	1 year	4
I	nation	2 months	4
J	nation	1 month	6
K	nation	1 month	3

This table clearly indicates the complementary character of the components: some of them (A,D and E) combine a high regional detail and a broad coverage with a low frequency of observation. Other components (G,I,J and K) have a high frequency of observation, but a low regional detail, and also a low coverage of variables. The latter components usually have been devised for special purposes: they contain data on specific aspects of employment such as wages, overwork, accidents, etc.

We conclude from the table that regional detail and frequency of observation are negatively correlated. The same holds true for the number of variables covered and the frequency of observation. A positive correlation is found between regional detail and the number of variables covered.

Ideally, the components of the data system can be used jointly for the analysis of labor market problems. In practice, it appears that often insufficient coherence exists among the components to make such a joint use meaningful. Differences in definitions, classifications and counting conventions used are considerable.

Figure 2, already presented in Section 3.1, reveals one of the backgrounds of incoherence in data systems for regional labor markets. There are essentially two units of observation: persons and positions, corresponding to two different sources of data: households and firms. When one approaches employment from the viewpoint of positions one will probably find other figures than when it is approached from the viewpoint of persons. Differences may occur, among others, since the region of work does not necessarily coincide with the region of residence. Further, certain groups of firms may be overlooked in the data collection. Also, some kinds of part-time work (e.g. when two persons occupy one position) may give rise to differences.

Coherence problems also arise when the number of vacancies is compared with the number of unemployed. In the Netherlands the unemployed persons and the vacant positions are registered by regional labor market offices. It is advantageous for unemployed persons when they are registered, since registration

entitles them to unemployment benefits. A similar advantage does not exist for firms when reporting their vacancies. Therefore, one may expect a tendency that the real number of unemployed is overestimated while the real number of vacancies is underestimated. In this situation it is questionable to use the number of unemployed persons minus the number of vacant positions as a measure of excess supply on the labor market. This clearly reflects a lack of coherence of statistical data on labor supply and labor demand.

4. MULTIREGIONAL LABOR MARKET MODELS

4.1 Models: Desiderata

Ideally, information systems do not only deal with a description of the present and the past, but also of the future. In addition, they should provide information on the possible impacts of policy measures. Thus, information systems should include tools to produce forecasts and impact assessments.

There are several tools to produce such results. For example, extrapolation methods may prove to be useful.

In this section we will focus on the use of multiregional labor market models to produce the desired results.

Which desiderata can be formulated for such models? The answer depends again on the aims of the users. In general terms the desiderata can be formulated as follows:

A first group of desiderata relates to the *kinds of outputs* such models should be able to produce. The models should produce results on a number of key variables such as employment, unemployment and vacancies. They should include policy handles to carry out policy analyses. The models should produce results of sufficient detail (both sectoral and regional). Finally, the models should produce outcomes for the appropriate time periods (short, medium and long run).

A second group of desiderata concerns the *quality of the outputs* indicated above. The quality of the outputs depends on the quality of:

1. the model (specification, estimation, and validation)
2. the data used for the estimation
3. the predictions of exogenous variables (used as inputs for forecasts or impact assessments).

We will now pay special attention to the way in which multiregional labor market models have to be specified. The first desideratum is that such models have an *integrated* structure. Since labor market phenomena are closely related to demographic and economic developments as well as to educational and social welfare systems, models for labor markets should take into account these interrelationships. This means either that integrated models have to be built, covering these fields simultaneously, or that models are built for each field separately with the possibility of linkage.

The second desideratum as regards the specification of models concerns the *interrelationships between regions and sectors*. Neglect of such interdependencies may give rise to unsatisfactory model outcomes.

The third desideratum relates to the treatment of *supply and demand* on the labor market. Ideally, both supply and demand are specified in the models. In addition, various adjustment mechanisms should be specified to deal with market disequilibria: wage adjustments, commuting, migration, entry and exit of the market, unemployment, interregional relocation of investments, and vacancies.

An important viewpoint according to which multiregional models can be distinguished is the relationship between national and regional variables. Four different structures can be distinguished in this respect (see Nijkamp and Rietveld, 1982): top-down, bottom-up, interactive regional-national, and non-interactive regional-national structures. These structures are illustrated in Figure 3. In this figure x_i^r denotes the i-th variable of region r; x_i denotes the corresponding national variable.

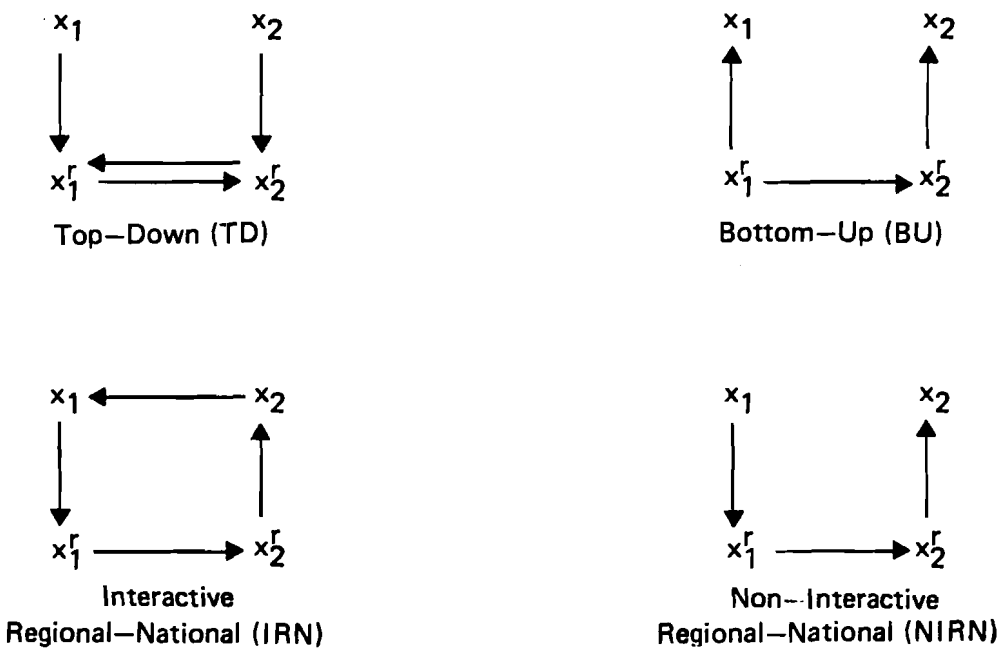

Figure 3. Examples of structures of multiregional models.

In a *top-down* (TD) model, the levels of the national variables are first determined, then the levels of the regional variables are determined in accordance with the additivity condition, so that their sum (or average) is equal to the national aggregate. In a *bottom-up* (BU) model, the regional variables are first determined; the national variables follow as resultants of a sum (or an average) of the regional variables.

The other two structures are combinations of these basic types. An IRN model gives rise to a completely interdependent model structure, which does not hold true for a NIRN model.

When comparing the appropriateness of these structures for multiregional labor market models, it should be noted that a BU approach is especially useful for markets operating at the regional level. Labor markets certainly belong to this class. On the other hand, a TD approach has the advantage that use can be made of the outputs of existing macro-economic models. A NIRN structure combines these advantages. As such an IRN struc-

ture is more general than a NIRN structure, but one should not underestimate the high costs of building models with an IRN structure.

4.2 Models: Practice

For a description of the practice of multiregional labor market modeling we will again use the international survey mentioned in Section 2.2 (see Issaev et al., 1982).

First we will pay attention to the extent of *integration* of the models. In Figure 4 it is indicated to which extent the labor market models also include economic and demographic submodels. The figure shows that 19 of the 40 multiregional labor market models are completely integrated. Of the rest, 18 models are partially integrated, while 3 models are not integrated at all.

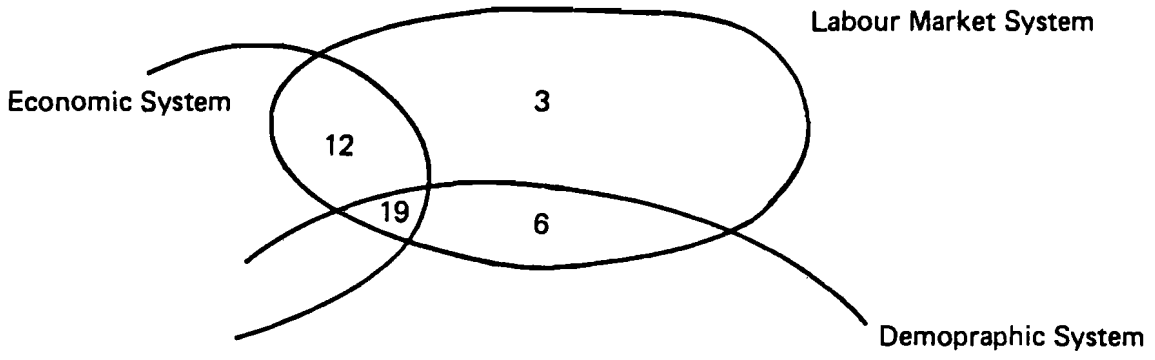

Figure 4. Scope of multiregional labor market models.

Another finding of the survey is that in the models the educational and social welfare systems are usually neglected or only treated in a superficial way. We may conclude, therefore, that multiregional labor market models on average do not reach a high level of integration.

Concerning the treatment of *supply and demand* in the models, we find that approximately 1/4 of the models have a demand oriented structure: the level of employment is exclusively determined by forces from the demand side. Only 2 models have a supply oriented structure. In the majority of the cases, a mixed orientation prevails: employment is determined by forces from both the supply and the demand side. Although it cannot be denied that for certain countries a pure supply or demand orientation in the models adequately represents reality, mixed models will in most cases be more appropriate since they can be used in principle both in times of slack and boom.

Another aspect of the treatment of supply and demand can be shown when we focus on the role of unemployment and vacancies in the models. We find that unemployment plays a role in circa half of the models, while vacancies are virtually missing. This finding reveals that disequilibria are only taken into account in half of the models. Further, it indicates an asymmetric treatment of supply and demand on regional labor markets. The obvious reason for this asymmetry is the lack of reliable data on vacancies at the regional level.

Another crudeness in multiregional labor market models is discovered when one considers the treatment of occupational mobility. When demand and supply are confronted with each other in the models, usually an aggregation is applied over all sectors or occupational categories. This means essentially that perfect labor mobility across occupations and sectors is assumed. In only a small number of models limitations are imposed on mobility.

Interregional relationships receive much attention in the models. This holds true especially for interregional trade, but also interregional migration is included rather frequently (approximately 1/3 of the models). In most of the models migration flows function as adjustment mechanisms for regional labor markets. Usually, the basic determinants relate to tensions on the labor market. In some cases, however, variables with respect to housing market and environmental conditions are the main determinants of interregional migration. In these cases, migration may aggravate rather than improve imbalances at regional labor markets.

Concerning the vertical structures in multiregional labor market models--the relationships between national and regional variables--we find that in approximately 50% of the cases a non-interactive regional-national (NIRN) model is used. The other three types: TD, BU and IRN models are distributed equally among the other 50%. This result reflects the variety of model structures in this modeling field.

As regards the time period on which multiregional labor market models produce meaningful results, we find that the medium term (say 5 to 15 years) dominates the picture. It appears that there are almost no models which combine a well developed demographic submodel with an adequate modeling of the capital formation process. Both components are a prerequisite for adequate long term studies. This situation can be explained, among others, by the fact that data on capital are poor at the regional level.

On the other hand, also really short term models are almost absent. The time unit is (with one exception) at least one year. This reflects the fact that the frequency of observation of regional data is relatively low (see also Section 3.2).

Another important time aspect of data is the timely availability. In the survey we find that the most recent regional data used in the models are on average rather old: at the beginning of 1982, the most recent regional data were from the period before 1975 for 50% of the models! This period is characterized by a rather stable growth pattern as opposed to the period after 1975. This certainly leads to a decrease in the relevance of the models for the problems of the 1980s. It is our impression that this long lag is not only due to the fact that regional data become available with considerable delay, but also to the fact that model builders do not pay sufficient attention to updating their models.

Finally, we will pay attention to the *use* of multiregional labor market models. We find that the following features are favorable for an extensive use:

1. builder: consultancy agency or governmental agency
2. structure: simple (partial rather than integrated)

3. regional and sectoral detail: high.

The accessibility of the model to users is in general low. Only in some cases, the model can be used without intervention of the model builder. The number of models with a completely documented user manual is comparatively low. We conclude that, on average, the potential of models as part of information systems for regional labor markets is only used to a small extent. There are some notable exceptions to this conclusion, however. The survey also includes some models in which accessibility to users (especially regional authorities) is quite high due to the use of a computerized network. This network can be used not only for the transfer of model outcomes to model users, but also for the transfer of basic regional data to the model operators.

5. CONCLUSIONS

We conclude that information systems for regional labor markets do not in all respects satisfy the desiderata formulated in this paper. In the paper we have indicated various approaches to improve this situation. One step is to improve the statistical data base in accordance with the needs of the users. Several underdeveloped elements of the data base have been mentioned. Another step is to improve the flexibility of the information systems as regards the regionalizations produced. Further, the possibilities to use labor market models as components of such information systems are not yet fully exploited.

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