DUALITY, SEGMENTATION AND DYNAMICS

ON A REGIONAL LABOUR MARKET

Jaap Arntzen*

Gunilla Bornmalm-Jardelöw**

Peter Nijkamp***

. *   Institute for Environmental Studies, Free University, Amsterdam
  **   Dept. of Economics, University of Gothenburg, Gothenburg
 ***   Dept. of Economics, Free University, Amsterdam

ABSTRACT

The paper is devoted to a study of regional labour market structures.
Attention is paid among others to spatial and occupational mobility in a
multiregional system. The dual labour market theory is critically reviewed,
followed by a discussion of a more general segmentation theory and a labour
market adjustment model.

In the paper an attempt is made to assess the degree of segmentation on a
regional labour market (both the demand and supply side) by means of a state
profile of relevant indicators. Due to the lack of reliable metric informa-
tion, a multidimensional scaling technique is used to infer metric conclu-
sions regarding the degree of segmentation at a regional labour market.
Multidimensional scaling techniques are also used to assess a soft econometric
model for explaining the (changes in the) segmentation on a regional labour
market.

The study will be concluded with an empirical application to some regions
in the Netherlands.

1. Introduction

Labour market problems receive increasingly attention from economists, social scientists, geographers and policymakers. Two reasons are responsible for the current interest in labour market analysis: (1) the present-day unemployment rates associated with the world-wide recession (the efficiency problem); (2) the unequal distribution of employment opportunities over individuals, groups or regions in an economy (the equity problem).

The neoclassical marginality theory has taken for granted an automatic correction mechanism on the labour market: the value of the marginal labour product should be equal to the wage rate, so that in case of frictions on the labour market the wage rate has to be adjusted.

The atomistic nature of the neoclassical allocation theory, its equilibrium framework and its homogeneity assumptions about labour supply have often been criticized (see Gordon (1972)). Adjustments and extensions of the traditional theory have been put forward inter alia by the human capital theory (see among others Mincer (1970)) and the job search theory (see among others Miron (1978), Phelps et al (1970) and White (1970)).

Alternative approaches have been developed among others in sociologically-oriented studies, for example, the institutionalistic theory (see Gordon (1972) and Van Voorden (1975)), the job competition theory (see Thurow (1972)), the dual labour market theory (see Piore (1971)) and the segmentation theory (see Edwards et al. (1975), Osterman (1975), and Vietorisz and Harrison (1973)).

Two main problems emerge in studying equilibrium and adjustment processes on the labour market:

- Job seekers are not moving freely within the national labour market due to psychological and/or physical distance frictions. This implies that we have to subdivide the labour market into smaller categories from the spatial point of view (the spatial segmentation).

- The labour market is not homogeneous and job seekers are not fully informed, so that also on the regional level a frictional and a structural disequilibrium may exist, caused by both supply and demand factors.

This paper focuses on the heterogeneity of supply and demand on a regional labour market. The purpose of the paper is to analyze the (degree of) discrepancy between categories (or segments) on the supply and demand side of regional labour markets. Since many indicators characterizing these

categories are nonmetric, multidimensional scaling methods will be used
to measure the metric distances between regional labour market segments.
Therefore, the present paper is organized as follows:
- A brief introduction to spatial aspects of the labour market will be
  given, in which especially adjustment problems and spatial segmentations
  will be dealt with (section 2.).
- A critical evaluation of one of the first segmentation theories, viz
  the dual labour market theory, will be given (section 3.).
- The explanatory and analytical contribution of more realistic segmenta-
  tion theories to regional labour market analyses will be discussed
  (section 4).
- A new method, viz. multidimensional scaling techniques, will be
  employed to asses the degree of segmentation (as well as shifts in this
  segmentation) on a regional labour market that is marked among others
  by qualitative or ordinal indicators (section 5).
- A closer examination of adjustment processes on (regional) labour mar-
  kets will be carried out with an emphasis on the dynamics of these
  processes (section 6).
- The foregoing segmentation analysis will be illustrated by means of
  an empirical application to Dutch regions characterized by structural
  imbalances at their regional submarkets (section 7).

2. The Regional Labour Market

Many labour market studies are primarily concerned with the analysis of
national patterns and developments of labour markets. The demand for labour
is often classified according to a sectoral subdivision.
Under ideal circumstances, the sectoral labour supply should correspond to
the sectoral demand for labour. When the total labour pool would be
homogeneous and when all agents would have full market information, a
disparity between sectoral supply and demand would in the neoclassical
view lead to an intersectoral adjustment process toward a wage rate such
that it is equal all over the country and everybody who will work at that wage
level is employed (see also Ratajczak (1979)).
The labour pool, however, is heterogeneous owing to differences in indi-
vidual motivations, capabilities, occupational skills, so that a struc-
tural disequilibrium on the labour market is often occurring. Such a

permanent disparity between supply and demand is even more likely owing
to the limited geographical mobility of job seekers; distance frictions
(in a physical or socio-psychological sense) appear to hamper very often
adjustment processes on the labour market. In the majority of labour
market studies the spatial aspects of the labour market are often neglected;
comparatively little is known about the working of the urban and regional
labour markets (cf. Button (1976)). A spatial labour market can be regarded
as a nodal area with a certain concentration of employment (for example,
various segments at the supply and demand side such as professional
groups or economic sectors). Such a spatial submarket determines the
employment opportunities of people in that area (and its surroundings),
while it plays also a role in linking together various parts of the
regional economic system (for example, the regional production structure,
the regional income pattern, the regional housing market, the regional
quality - of - life, and so forth).
Several reasons can be mentioned to take explicitly account of regional
labour markets:

- the regional labour market is the major spatial factor market where
  demand and supply meet each other.
- the regional labour market determines to a great extent the welfare
  level of the area at hand.
- the regional labour market may reveal certain frictions in the labour
  market which are neglected in an average national approach (for example,
  a local disequilibrium between demand and supply emerging from a speci-
  fic industrial orientation of a region).
- an analysis of the regional labour market may reveal certain spatial
  welfare elements which are neglected in a global national analysis.
- the regional labour market may affect the location decisions of house-
  holds (and hence the spatial settlement pattern).
- the regional labour market is an open system, so that it is affected
  by surrounding labour markets and vice versa (for example, commuting
  may serve as a means to solve supply-demand frictions at a local market).

Due to the heterogeneity of the labour market and the role played by
distance frictions, it is meaningful to divide a labour market into cer-
tain segments. In this respect, professional mobility reflects essentially
the dynamics between various segments on the labour market. In the frame-
work of a system of regional labour markets, spatial mobility reflects in
fact the interregional dynamics between spatial entities of the total labour

market. Thus, geographical and occupational mobility may be regarded as the
outgrowth of discrepances between labour submarkets, viz between regions
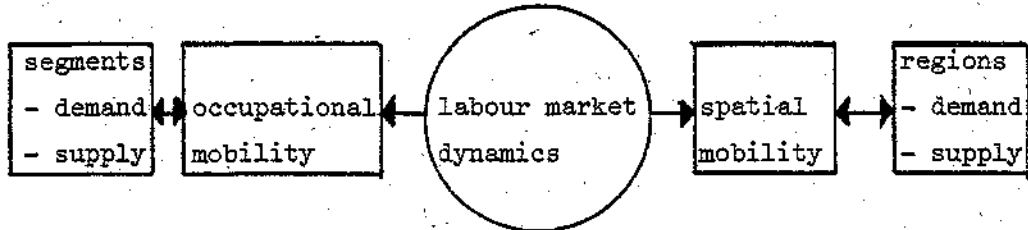and segments, respectively. This is briefly summarized in Fig. 1.

Fig. 1. Mobility pattern of a labour market.

It is clear that the degree of mobility is a result of supply-demand condi-
tions at the various sub-markets, but also of the communication network and
the information network.
The idea of spatial mobility for certain segments on the labour market may
be illustrated by making a theoretical distinction between the spatial
treshold value (the maximum distance people are willing to travel between
home and work every day) and the spatial range (the minimum distance associa-
ted with a supply of labour which is sufficient to guarantee a continuation
of production). Given the location of potential workers, the threshold
value (v) and the range (r) can be translated into contour lines around a
certain local labour market (see Fig. 2) (this idea bears some resemblance
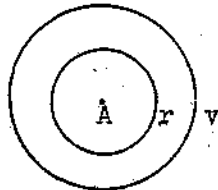to the Christaller framework for commodities; cf. also Lloyd and Dicken (1977)).

Fig. 2. Threshold and range of a local labour market.

It is easily seen that in the case of Fig. 2 (r $<$ v) there is no necessity
for spatial mobility towards other areas, as long as demand and supply with in
the area are in equilibrium (no adjustment processes). If, however,demand is
less than supply, the regional labour market is characterized by excess supply.

Then adjustment processes such as wage decline or outmigration may take place. On the other hand, as soon as r $>$ v, the demand for labour cannot be satisfied within the area itself (a situation of excess demand). In that case, adjustment processes (commuting from other areas, inmigration, wage rises etc.) may be necessary.

The aim of the present study is to identify discrepances (if any) between certain segments on the labour markets. Therefore, one has to take into account the dynamic and spatial aspects of the situation on these markets. Suppose a country or an area is composed of R regions (1,...,R), while the labour market in each region has I segments (1,...,I). Then the following figure may be used to illustrate the meaning of the analysis exposed later (Fig. 3). Each elements of the
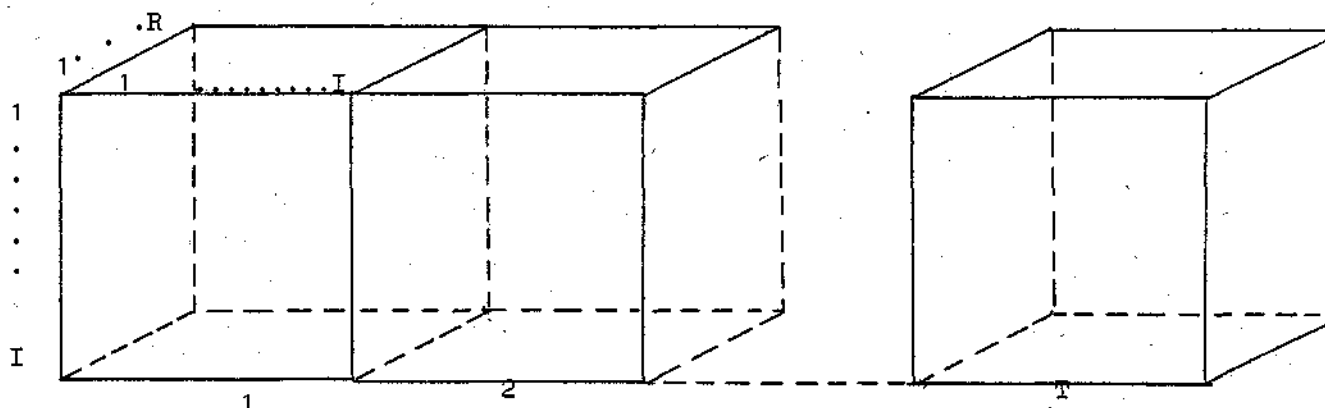

Fig. 3. A spatial-temporal block of discrepances between labour market segments.

blocks in Fig. 3 reflects the relative distance between any pair of segments on the labour market of a certain region in a certain time period t(t=1,...,T). The way in which these distances can be calculated will be discussed in section 6,but suffice it for the moment to say that these distance indicators can be regarded as a cardinal measure to calculate the degree of segmentation at local labour markets at each time period.

First, however, a more formal approach to regional labour market analyses will be presented.

The segmentation on the labour market is mainly due to the heterogeneity of labour categories so that adjustment processes only take place with

delays after several time periods. Such rigidity is emerging from two sides, viz. the _demand_ side and the _supply_ side.

The demand side can be analysed via derived demand functions of labour inputs (cf. Bartels (1977)). For example, the demand for labour of type c in sector k can be represented as l_{ck}^d. This demand may be related _inter alia_ to the production of sector k, the relative input prices of sector k, and the technical progress in sector k.

The supply side of the labour market in a certain region can be studied via a supply function l_{cj}^s, which represents the supply of labour of category c in age-sex group j. This regional labour supply depends on the regional demographic structure, the labour participation rate, the commuting rates, and so forth.

Therefore, the discrepancy d_c between supply and demand for each job category c in a certain time period is equal to:

$$(1) \quad d_c = l_c^s - l_c^d$$

$$= \sum_j l_{cj}^s - \sum_k l_{ck}^d$$

Hence, the total number of unemployed people is (provided $l_c^s \geqslant l_c^d$):

$$(2) \quad u = \sum_c d_c$$

It is clear that each category c has its own characteristic features on the labour market. The degree of segmentation between these categories is higher as the divergence between these features increases. Clearly, this degree of segmentation can be studied at the supply and at the demand side of the labour market.

By introducing explicitly the spatial element into (1) and (2), one arrives at the following expression for the discrepancy d_c^r for region r :

$$(3) \quad d_c^r = \sum_j \left(l_{cj}^{s,rr} - \sum_{\substack{r'=1 \\ r' \neq r}}^R l_{cj}^{s,rr'} + \sum_{\substack{r'=1 \\ r' \neq r}}^R l_{cj}^{s,r'r} \right) - \sum_k l_{ck}^d \quad ,$$

where $l_{cj}^{s,rr'}$ represents the flow of labour supply of category j from region r to r'. It is clear that the latter flow is determined by the relative attractiveness of region r' compared to r. This attractiveness is functionally linked to wage differentials between region r and r', differences in

the quality - of - working - places, sociological discrepancies and so forth.
The internal labour stock $l_{cj}^{s,rr}$ is a function of the attractiveness of region
r, which is in turn determined by the demographic profile of region r, the
educational facilities, the environmental conditions etc.

The demand for labour is co-determined by the sectoral attractiveness,
such as profitabilities in previous periods, the average investment and labour
costs, the growth in labour productivity etc.

In general, it should be noted that both the supply and the demand of labour
are lagged functions of attractiveness indicators. Therefore, the following
figurative representation may be given:
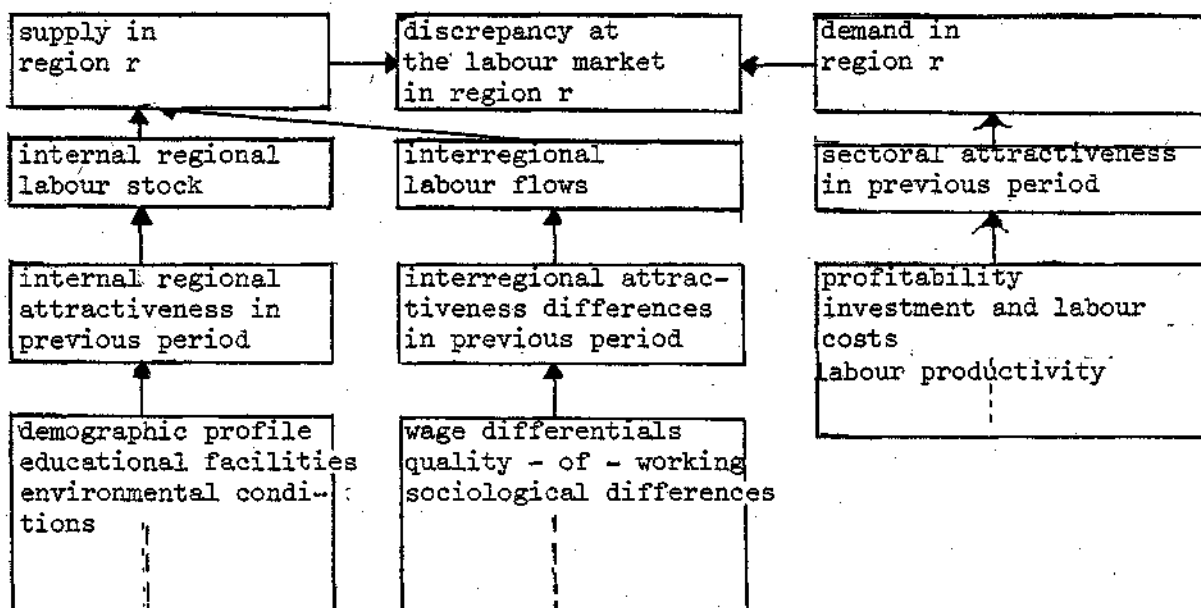
Fig. 4. An integrated framework for spatial
labour markets.

The most plausible approach would be to construct an econometric model on
the basis of Fig. 4 and to assess the discrepancies between labour market
categories on the basis of this model (cf. Heijke and Maas (1978)). In
reality, however, many elements of the attractiveness profile of the cate-
gories are not measured in a metric sense, but rather in a qualitative or
ordinal sense. This lack of accurate data hampers the construction of an
integrated spatial labour market model. Since our interest is mainly in
measuring the relative discrepancy between labour market segments, adjusted

methods have to be devised. First, however, a survey of theories on labour
market segmentation will be given.

3. The Dual Labour Market Theory.

In the previous section, it has been demonstrated that the labour market is
rather heterogenous and diversified. In the recent past several attempts
have been made to subdivide the labour market into categories and segments.
One of the first segmentation theories is the dual labour market theory.
In this section, this theory will be discussed briefly,while in the next
section the more realistic concept of segmentation will be dealt with.
Other theories related to the dual labour market concept are the radical
theory (Edwards et al. (1975) and Cain (1976)) and the job competition
theory (Thurow (1972) and Cain (1976)). They will not be discussed in this
paper.

The dual labour market theory has been developed in the United States. From
several studies on the labour market situation in various city areas empiri-
cal evidence could be shown for the existence of two segments on the labour
market, which were, to a large extent, operating independent from each other
(Doeringer and Piore (1971), Gordon (1972), Piore (1975) and Valkenburg and
Vissers (1978)).Large and high-wage industries appeared to move out of the
city-centres, whereas small and labour-intensive industries remained in the
centres.
Consequently, people who could not afford to follow the large industries
(for instance, ghetto-inhabitants) were obliged to fill up the low-wage jobs
offered in these centres.
In this theory, the labour market is assumed to be divided into two segments,
namely a primary and secondary segment.which are operating fairly independent
from each other.
The primary segment is characterized inter alia by job stability and respon-
sibility, good working conditions, including good career prospects and high
wages.
The secondary segment is characterized by the opposite factors: job instabili-
ty, less good working conditions and low wages.
Once an individual has entered the secondary segment, it is hard for him to
shift to the primary segment. On the contrary, it is possible – though not
likely – to shift from the primary segment to the secondary one. Thus, the
position in the labour market is crucial in the dual labour market concept.
Basically, two explanations for the emergence of these segments can be provi-
ded (Vissers et al. (1977)):

- the changing <u>industrial</u> structure.

  This has led to the growth of large, capital-intensive industries, which are able to pay high wages and to improve and control their market position by adopting technological changes and by enlarging their sales market (Valkenburg and Vissers (1978) and Schoemaker et al. (1978). The secondary segment is composed of stagnating, labour-intensieve industries; some of those are performing irregular production for large industries (Edwards et al. (1975)).

- the changing <u>functional</u> structure.

  This has caused the creation of firm-tied jobs. Industries are gaining benefits from internalizing the firm-tied jobs inside the firm in order to minimize on-the-job-training-costs. Clearly, this explanation is closely linked to the concept of internal and external market segments (in the American and English literature primary and secondary are almost used as synonyms for internal and external labour markets (Schoemaker et al. (1978)). However, Mok (1975) has divided both the primary and secondary market into an internal and external segment.

This makes clear that segmentation forces are operating on both the firm level and the job level (thus inside the firm). Valkenburg and Vissers (1978) have distinguished segmentation tendencies on four levels:

1) branches of industries

   Primary branches are characterized by: rapid growth, high profit ratio, high capital intensity ratio and a relatively high average wage level. Secondary branches are characterized by the opposite factors.

2) industries

   The size of the industry is thought to determine the position on the labour market, namely in the primary segment (large industries) or in the secondary segment (small industries).

3) jobs

   Some characteristics of primary and secondary jobs are mentioned before: job stability and responsibility, working conditions, career prospects and wage level.

4) employees

   As criteria can be mentioned: race, sex, working attitude[1] and nationality (Mok (1975) and Schalkwijk (1978)). Individuals are assumed to be treated on the basis of special supply-characteristics. In general, participants from minority groups have secondary jobs (Gordon (1972)).

   1) This is not an autonomous supply-characteristic; it results partly from the actual position of the employee on the labour market.

The concept of duality allows to take into account the <u>dynamics</u> of the labour market. Dynamic processes in a temporal context are related to shifts in industrial and functional structures (apparently the 2 segments are related to a certain extent). The idea of dynamic processes is illustrated for the industrial sector in figure 5.

new jobs, technologies and new industries   disappearing professions, jobs and industries
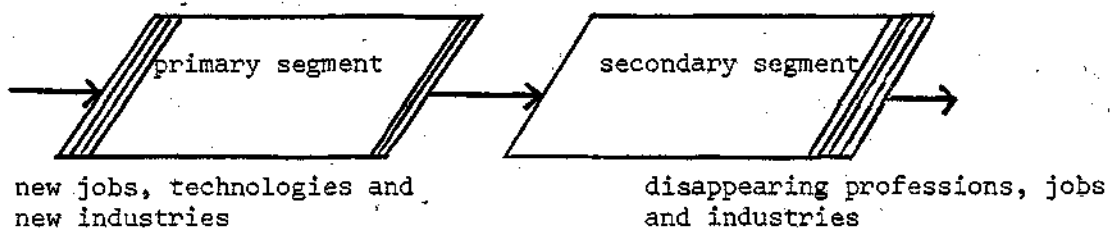
Fig. 5. Dynamics in the segmentation of the industrial sector.

Source: Valkenburg and Vissers (1978, pp. 217).

Mok (1975) has emphasized the importance of the strategic behaviour of market parties[1]. Parties, at both the demand side and the supply side, try to accomodate the labour market to their own preferences. Generally, it is assumed in the theory - explicitly (Mok (1975)) or implicitly - that forces operating at the demand-side are dominant. In addition, strategic behaviour of employers and employees may be influenced or even controlled by the unions and the government.

Van Voorden (1979) concluded recently that the hypothesis of dominance of strategic behaviour at the demand-side is not yet proven in an adequate way.

Evaluating the concept of duality, Van Voorden emphasises that the concept of the dual labour market has failed offering a theoretical framework for analyzing the labour market. Differences in interpretation of this concept are due to the missing definitions of the items. For instance, an important duality criterion such as job stability is not operational. Consequently it is hard to define the primary and secondary segment for empirical applications and to establish (dis)-similarities with the concept of internal (inside the firm) and external (outside the firm) labour markets. This endifficults practical application of the duality concept (see also Van Voorden (1977)). Moreover, no adequate evidence has been presented for the existence of only two segments of the labour market. This might be caused by the fact that the duality concept, originally limited to the American urban labour markets, has been transferred rather uncritically to the European labour market analyses (Van Voorden ((1977)).

Some points of comment on the dual labour concept are summarized in Table 1.

[1] This point is stronger emphasized in the radical theory.

Table 1 : Judgment of dual labour
market concepts

pro

. integration of demand and supply
  characteristics in both an econo-
  mic and a social sense.

. empirical applications have pro-
  ved the existence of segmentation
  forces operating on the labour
  market.

. the concept is derived from rea-
  lity (urban labour markets in the
  USA) and thus not from mere theo-
  retical considerations.

. the concept is based on dynamic
  processes -though not clearly-,
  operating on the labour market
  (temporal dynamics).

contra

. duality is not yet demonstrated; on
  the contrary, some empirical studies
  conclude that segmentational forces
  cause the emergence of a multipli-
  city of segments.

. the indicators for duality and hence
  for the primary and secondary seg-
  ments themselves are not clearly
  defined.

. the relationship to the concept of
  internal - external labour market
  is interpreted in different ways.

. the importance of and the processes
  behind strategic behaviour of the
  market parties are also interpreted
  in different ways.

. spatial mobility is not included.

. the concept is often limited to the
  industrial sector.

4. Labour Market Theories on Segmentation

In fact, Piore (1975) has already adjusted the original dual labour market concept by dividing the primary segment into upper- en lower tier jobs. The upper tier of the primary segment is composed of professional and managerial jobs, which are distinghuised from the lower tier by the higher wage and status and the greater career prospects afforded.

In general, segmentation theories may be regarded as more realistic than duality theories.(cf. also the earlier theories of non-competing groups).

The main difference between the duality concept and the segmentation theories is the number of segments to be distinguished. Growth processes of segments are explained in the same manner (though segmentation theories allow to account for specific factors); changes in industrial and functional structures are considered to be the most important ones.

Mok (1975) has distinguished 4 segments; these segments result from a combination of the duality-concept and the concept of internal and external labour markets : an internal primary and secondary segment and an external primary and secondary segment. Valkenburg and Vissers (1978) have divided the labour market into 12 segments. These are shown in figure 6.

demand-side

	primary industries		secondary industries	
	primary jobs	secondary jobs	primary jobs	secondary jobs
primary employees				
secondary employees				

supply-side

Fig. 6 . Segmentation scheme for the labour market.
Source : Valkenburg and Vissers (1978).

In figure 6, segmentation forces on both the demand side and the supply side (employees) are present. Elsewhere, Vissers (1977) has distinguished only three segments ;

1) a stability-oriented segment (mainly internal);

2) the traditional labour market (by definition external);

3) a segment of low-classified and irregular jobs.

The above mentioned examples of segmentation theories show the heteroge-
neity in these theories. This concerns mostly the number of segments distin-
guished. To test the relevance of the segmentation concepts, practical appli-
cations are required. In this respect, it is necessary to construct a set of
relevant characteristics of the labour market.

A distinction can be constructed between segmentation indicators at the
demand side (branch of industries, industries and/or jobs) and segmentation
indicators at the supply side (personal characteristics). An example of such
a list of relevant indicators is presented below in Table 2.

Table 2 : Some indicators for segmentation.[1]

Demand-side

1. job stability and responsibility
2. quality-of-work-conditions
3. filling of vacancies (internal or external)
4. firm-specific job characteristics
5. career prospects (mobility within the firm)
6. size of the firm
7. capital intensity, labour productivity
8. average wage level
9. growth perspectives, for instance, based on investment ratios

Supply side

1. sex
2. race
3. age
4. educational level
5. working attitude, with regard to unemployment, aspirations and
   so on
6. membership of unions

Clearly, not all these indicators are entirely quantifiable. Several of
them can only be measured in an ordinal or qualitive way. Therefore, a multi-
dimensional scaling technique (see section 5) is necessary to draw quantitative
inferences about segmentational forces.

Segmentation theories may be considered as a criticism on the duality con-
cept as well as an evolution of this concept. The criticism concerns the dua-
lity hypothesis; the evolution concerns the hypothesis of segmentation ten-
dencies on the labour market. In this way, this concept must be considered as

1) See for instance Doeringer and Piore (1971) , Piore (1975) , Mok (1975),
   Schalkwijk (1978) and Valkenburg and Vissers (1978).

a substantial improvement of other labour market theories (see section 1).

Nevertheless, there are some weaknesses left in segmentation theories. Again, time dynamics is not made very clear, whereas spatial dynamics is generally lacking.[1] In this paper an attempt is made to incorporate explicity temporal and spatial dynamic forces (see section 6).

It remains also difficult to prove the existence of segments on the labour market. This presupposes the use of operational indicators for segmentation and the availability of techniques in order to operationalize these indicators. In a recent study, Valkenburg and Vissers (1978) have presented some empirical results concerning segmentation tendences on the Dutch labour market. Previously, Osterman (1975) has shown some results regarding the U.S. labour market. In section 7 a multidimensional scaling technique is used to analyze segmentation tendencies on a Dutch regional labour market.

1) Until now, segmentation theories are only developed at a national or an urban level, but not in a really spatial sense.

5. A Multidimensional Scaling Method for Measuring the Degree of Segmentation.

A detailed analysis of the degree of segmentation at the regional labour market would require the definition of a large set of various segments, for example by making a distinction according to age, race, sex, occupation, education and so forth. A further classification can be made according to regions or time periods. It is normally assumed that all distinct subgroups have their own characteristic features which determines their position on the labour market (for example, wage-rate differentials, career prospects degree of unemployment etc.). Therefore, it is plausible to construct a set of indicators for the segmentation on a labour market. Because the degree of segmentation is the result of a combination of economic, social and other factors, it is meaningful to construct a broad set of socio-economic segmentation indicators for both the supply and the demand side of the labour market. Hence, the assumption is made that a segment is characterized by a multi-attribute profile (cf. Van Delft and Nijkamp((1977))and Nijkamp and Van Veenendaal (1978a)).

In case of I segments and N segmentation indicators, the following multi-attribute profile for a certain regional labour market can be constructed:

(5.1.)

$$
\begin{array}{c}
1 \ldots \ldots \ldots \ldots \ldots I \\
\begin{array}{c}
1 \\
\cdot \\
\cdot \\
\cdot \\
\cdot \\
\cdot \\
\cdot \\
N
\end{array}
\boxed{}
\end{array}
$$
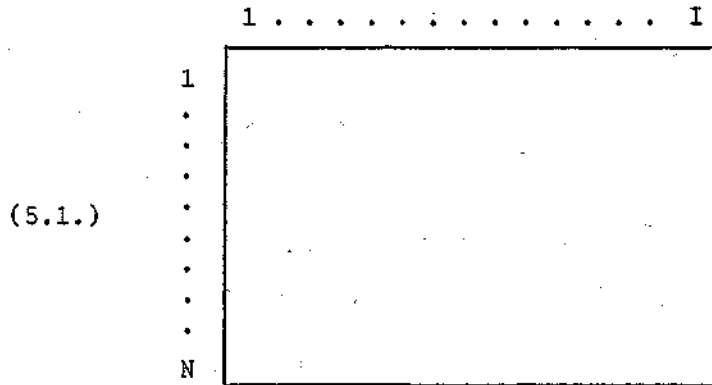
A major problem inherent in a detailed analysis of segments on a regional labour market is the lack of reliable or quantitative data. Certain segmentation indicators (for example, future career prospects) are clearly of a soft nature (for example, only qualitative or ordinal). Therefore, it is necessary to employ an adjusted method which is able to deal with soft data of a qualitative or an ordinal nature.

The most appropriate method to deal with soft information is a multidimensional scaling (MDS) technique. Such a technique is especially relevant for non-metric information. The essential feature of MDS techniques is its ability to transform non-metric information into metric information of a lower dimensionality. These techniques were originally developed in mathema-

tical psychology, but are now being used in many other disciplines such
as geography, economics, planning theory, marketing theory etc (see for
a survey among others Nijkamp and Van Veenendaal (1978b), Nijkamp and
Voogd (1979) and Voogd (1977)). MDS techniques provide the tools to ex-
tract from ordinal and qualitative information a smaller set of quanti-
tative metric measures which characterize the original items as good as
possible.

The basic characteristic of MDS methods is that (dis)similarities
among items can normally only be ranked as ordinal differences among the
attributes of the items (for example, the indicators of the labour mar-
ket segments). By employing an MDS method, a geometric representation
of the position of the attributes as well as of the items in a Euclidean
space of a given, but lower dimension is possible. The representation
of the original ordinal data in a new geometric space with fewer dimen-
sions implies that more ordinal conditions are available than geometric
coordinates are necessary. Hence, MDS methods use a certain abundant
information to transpose ordinal input data into metric output data.

The coordinates of the positions of the attributes and of the
items are to be determined such that the interpoint distances between
the points in a geometric space do not contradict the ordinal conditions
implied by the input data, but rather guarantee a monotonicity between
the original (ordinal) (dis-)similarities and the Euclidean distances
in a geometric space of a lower dimensionality. The mathematical tech-
nique itself will not be elaborated here; the various steps and algorithms
used can be found among others in the abovementioned references.

The important consequence of this MDS technique is that all segments
of a regional labour market can be positioned in a Euclidean space, so
that the Euclidean distances between the segment points may be regarded
as a cardinal measure for the discrepances between the segments. In this
way the degree of segmentation can be determined in an operational sense.
Similary, the differences between the regional labour markets for each
segment and their dynamics can be assessed.

6. Adjustment Processes on a Regional Labour Market

In the previous chapters it has been emphasized that the labour market is not a static phenomenon, but a complex and dynamic entity which is in a permanent movement. Occupational mobility, spatial mobility, changes in segmentational tendencies, and shifts in the economic position of sectors lead to a great variety of adjustment processes, which cannot be described in a static framework. The degree of segmentation is mainly determined by the development of the labour market. Therefore, it may be worthwhile to try to develop an explanatory framework which links the degree of segmentation in a functional way to a set of relevant labour market variables.

In section 4 several categories of segments have been distinguished by means of a set of indicators. These indicators can be used to calculate a measure for the degree of discrepancy between various segments (see section 5). This segmentational difference σ_{ij} between two segments i and j can now be regarded as an endogenous variable to be explained by a set of explanatory variables.

The difference between any two segments can be ascribed to two phenomena, viz. the relevant characteristics of these segments (an internal profile) and the characteristics of other segments (an external profile). This reasoning / runs parallel to the job search theory for individual behaviour, in which the competitive power of a job seeker is determined by his internal profile (professional education, age, etc.) and the external profile (the qualities and the quantity of competitors on the same market).

The competitive structure between labour market segments is reinforced by the existence of spatial submarkets, so that the openness of a spatial system leads once more to adjustment processes in various parts of the labour market. The external profile of competing segments (either in the region itself or in surrounding regions) influences the segmentation difference between any two segments with a certain time lag. Therefore, the following general model can be assumed for the difference between two segments:

$$(6.1.) \qquad \sigma_{ij,t}^{rr} = f\{(\underline{p}_{i,t}^{r} - \underline{p}_{j,t}^{r}), \; \bar{\sigma}_{t-1}^{r}, \; \sigma_{ij,t-1}^{r'r'}\} \quad ,$$

where:

$\sigma_{ij,t}^{rr}$ = segmentation difference between segment i in region r and segment j in region r during time period t.

$\underline{p}_{i,t}^{r}$ = segmentation profile (set of indicators) of segment i in region r during period t.

$\bar{\sigma}^r_{t-1}$ = average pairwise difference between all segments in region r during period t-1.

$\sigma^{r'r'}_{i\,j,t-1}$ = segmentation difference between segment i in surrounding region r' and segment j in surrounding region r' during period t-1.

The last two arguments of (6.1.) refer to the competitive structure of the labour market. Due to substantial differences between segments, people may attempt to move from the one segment to another one (for example, by improving their professional education) or to move to the same segment in another region (for example, by migrating or commuting). An equilibrium situation may occur as soon as the intraregional differences between various segments and the interregional differences between the same segments have vanished. It is clear that in case of a combined time series – cross section approach, model (6.1.) may become a completely interdependent spatial econometric model (see also Hordijk and Nijkamp (1978)).

When all data required to estimate (6.1.) are available, a normal regression analysis can be carried out. In the previous section, however, it has already been set out that in many cases only soft information is available. In that case an adjusted approach has to be chosen, which may be based on so-called 'soft econometrics'. Soft econometrics attempts to estimate quantitative relationships between variables on the basis of soft (ordinal, qualitative) information. Although the presence of soft information is a rule rather than an exception, econometric model building has paid very little attention to this field.

In the framework of the present paper, it is meaningful to tackle the problem of soft information by means of the abovementioned multidimensional scaling technique. Suppose the following model:

(6.2.) $y = f(\underline{x})$,

where $\underline{x}$ is a set of ordinal variables. If we have a set of observations on $\underline{x}$, a regression procedure can only be carried out if $\underline{x}$ is measured in cardinal units. Now the following procedure can be used. The observations on the set of variables $\underline{x}$ can be included in a matrix X. This ordinal matrix can be transformed into a cardinal matrix of a lower dimensionality by means of the multidimensional scaling procedure. When we call this new matrix X*, we may obtain the following regression model:

(6.3.) $y = X^* \underline{\beta} + \underline{\varepsilon}$

where $\underline{y}$ is the set of metric observations of the endogenous variable, X^* the reduced matrix of metric data related to the explanatory variables, $\underline{\beta}$ a vector of unknown parameters and $\underline{\epsilon}$ a disturbance term. This model can be estimated in the usual way. It can also be used as a prediction model, when future (ordinal) values of the explanatory variables are available. In this way, model (6.1.) adjusted via (6.3) can be used as a model that describes adjustment processes on the regional labour market (via the segmentation differences).

## 7. An Empirical Application to Regional Labour Markets

The abovementioned theories and methods offer a broad spectrum of potential applications to regional labour market analyses. In the present paper only a few of such applications will be dealt with.

The area studied in this paper is the southern part of the province of Limburg in the Netherlands (see Map 1). The labour market in this area is characterized by relatively high unemployment rates (compared to the average Dutch level and compared to other Dutch problem areas). Before 1965, mining was the main activity in this area; the mine industries dominated not only the labour market (there were 58,000 mine-workers in 1958) but also the the socio-economic and cultural structure of this area.

In 1965 the Dutch has decided to close the mines. At that time, almost 20 per cent of the labour force was employed in the mine industry.[1] The loss of jobs was planned to be compensated by creating new jobs in this area by means of a strong regional industrialisation policy. From 1965 onward, more than 20.000 jobs, subsidized by the national government, have filled, to a limited extent, the gap between supply and demand of labour. This policy, however, has only partially been succesful because not all former mineworkers could find an appropriate job in the new industrial sectors. The resulting long-lasting shortage of jobs has led to a spatial labour movement, viz. high commuting flows to Germany. The remaining part of the former mine-workers became unemployed. This unfavourable situation on the labour market might have had a negative impact on the absence ratio due to illness and on the work attitude.[2]

In view of above mentioned situation, one may expect segmentational forces on the labour markets in south Limburg. The following factors may justify this assumption:

1) In the so-called Eastern Mining Area (see Map 1) this share amounted to more than 35 per cent (see Arntzen (1978)).

2) At present, research is being undertaken to gain in sight into the causal factors behind these phenomena.

THE NETHERLANDS

BELGIUM

EASTERN

Heerlen ●

MINING

GERMANY.

● Maastricht

AREA

BELGIUM
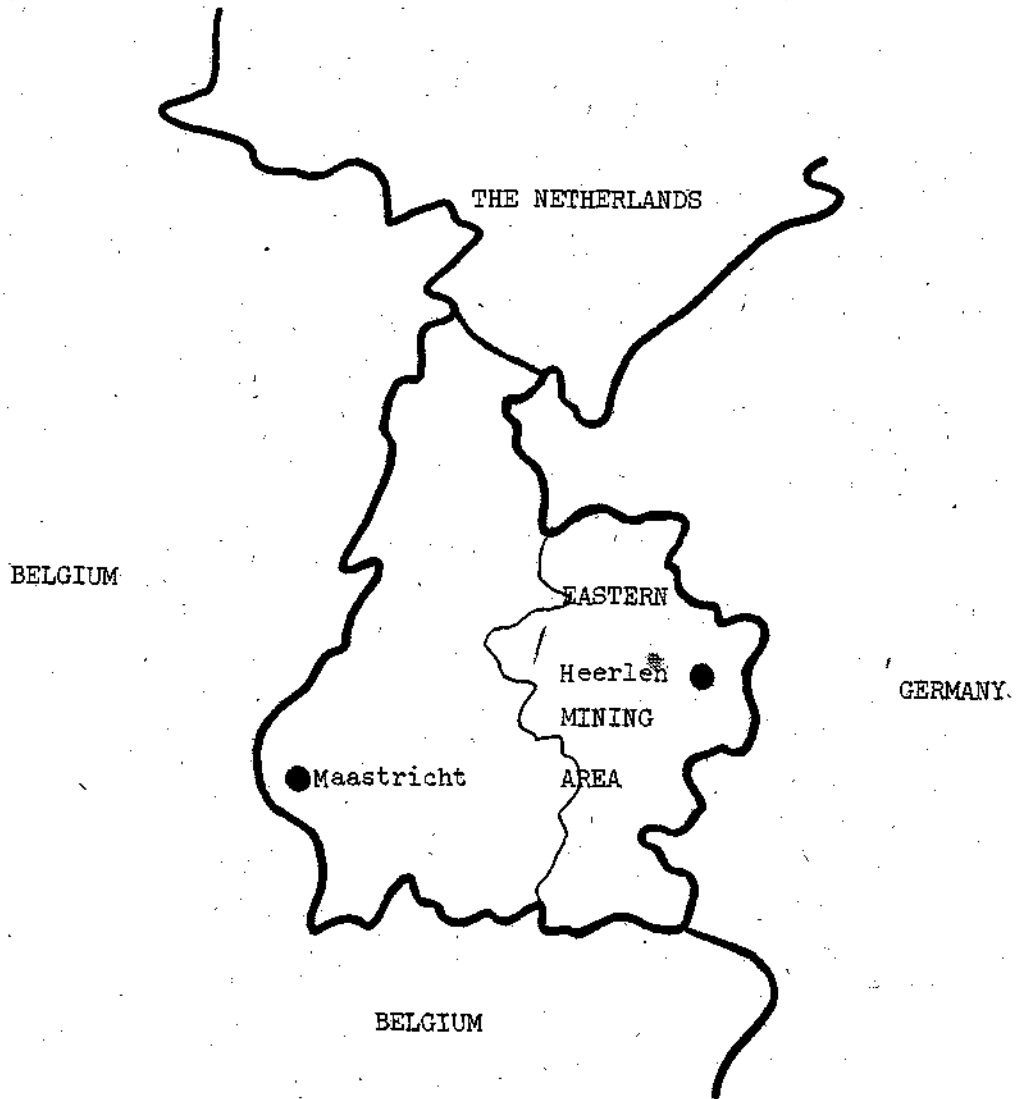
Map 1. South Limburg

- The industrial growth of this area has been rather unstable: the mine industries have disappeared; the textile industry has demonstrated a rather quick temporary rise, but is also facing serious problems now; the chemical industry has been an important attraction pole in South Limburg, but the future prospects of this industry are rather uncertain at the moment.

- The uncertainty about the perspectives of this area have affected the degree of absenteism, illness and productivity in the declining sectors.

- The rather fundamental perturbations in the regional labour market have affected almost all occupational groups, so that segmentational forces in the various sectors may become more apparent.

- The situation of excess supply of labour enables the employers to recruit their employees more critically.

In the present paper the hypothesis of a segmentated labour market will be tested for two regions in this area concerned, viz. South Limburg as a whole and the Eastern Mining Area (see Map 1). Ideally, a test of this hypothesis would require information concerning all segmentation indicators included in section 4. Lack of statistical data, however, has prevented a complete analysis of the segmentational structure of the labour market. Only a limited number of indicators could be found for which (ordinal) information was available. This information was mainly related to branches of industries. A more thorough analysis would certainly require many time-consuming efforts in collecting data, but for the aim of this paper, viz. to show the applicability of multidimensional scaling techniques for regional labour market analyses, the poor data base is sufficient for the moment. Six industrial sectors have been selected: three primary, viz. chemistry (I), food (II) and paper industry (III) and three secondary, viz. textile (IV), clothing (V) and building industry (VI) (see also Valkenburg and Vissers (1978),p. 265). The segmentation indicators which could be identified (in ordinal terms) for this case study are included in Table 3.

Table 3. Segmentation indicators used for South Limburg and the
Eastern Mining Area.

no.	Indicators:	available in: South Limburg	available in: Eastern Mining Area
1	average production growth	x	x
2	extent of favourable development of employment	x	x
3	labour intensity (man-years/prod)	x	
4	share of female employees	x	x
5	future perspectives of the industry	x	x
6	average size of industries	x	
7	average wage level	x	
	level of education of employees:		
8	. low	x	x
9	. high	x	x
10	percentage of employees younger than 35 years	x	x

A multidimenstional scaling algorithm[1] was applied for both areas
separately, for the six abovementioned industries and for the indicators
included in Table 3. The joint metric results related to both the industries
and the indicators of South Limburg are plotted in Fig. 7 for one dimension.
The goodness-of-fi. ('stress') appeared to be already extremely good for one
dimension, viz. 0.016. This indicates that one dimension provides already an
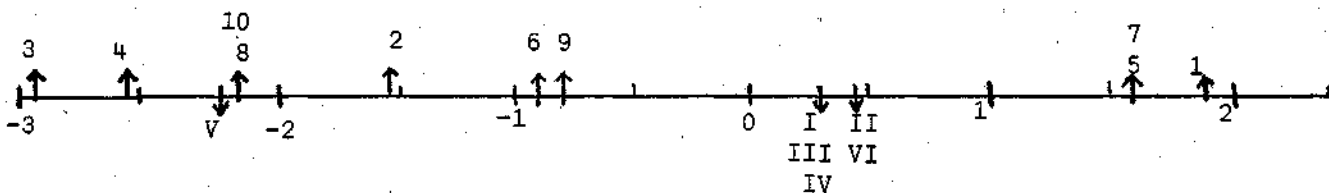extremely good fit between the ordinal input data and the metric results.

Fig. 7. Joint metric configuration of industries (↓) and segmentation
indicators (↑) for South Limburg.

The lower part of Fig. 7 represents the metric distances between the six industries. It turns out that the cluster composed of the chemical sector, the paper industry and the textile industry is completely homogeneous from the point of view of the segmentation indicators. The same holds true for the cluster composed of the food sector and the building industry. In addition, both clusters show a marginal discrepancy. On the other hand, the clothing industry shows a large discrepancy with respect to the remaining industries. This is mainly due to the labour intensity, the large number of female workers, and the large number of young and unskilled employees in the clothing industry. The latter observation results also from an analysis of the upper part of Fig. 7, because the indicators 3, 4, 8 and 10 are closely located near (and thus associated with) the fifth sector. Some other indicators, viz. 1, 5 and 7, are more closely related to the remaining sectors, while indicators 2, 6 and 9 take an intermediate position.

On the basis of the results of Fig. 7, one may draw the conclusion that a clear segmentation does exist between sector V and the remaining industries. Given the positions of the attributes and the industries in Fig. 7, the left-hand axis may be interpreted as labour intensive activities (with a large number of female, young and unskilled employees), whereas the right-hand axis reflects the growing larger industries (with a reasonable future perspective). The activities at the left-hand side are more primary-oriented industries; the opposite holds true for the right-hand activities, although this distinction is not quite clear.

The positions of the industries and indicators related to the <u>Eastern Mining Area</u> are represented in Fig. 8. Here again a one-dimensional representation has been chosen, although the stress is somewhat less favourable here, viz. 0.213. This is mainly due to the lower number of indicators available for the area at hand (see Table 3). Therefore, the configuration is less in agreement with the ordinal input data, although the stress value is not completely unreasonable [1].
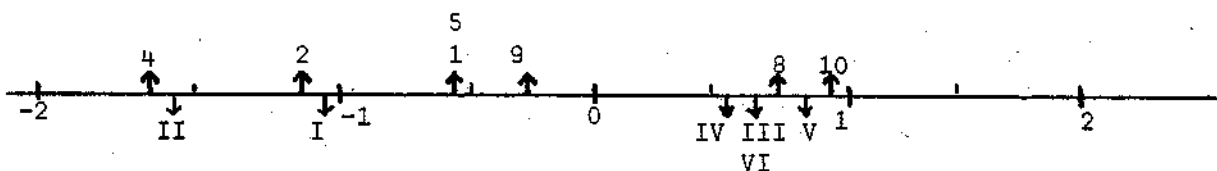
Fig. 8. Joint metric configuration of industries (↓) and segmentation indicators (↑) for the Eastern Mining Area.

[1] The stress value for a two-dimensional configuration is very low, viz. 0.009.

The results from Fig. 8 show a less clear pattern than those from Fig. 7, but a certain similarity is undeniable. Sector V appears to have again an extreme position mainly characterized by young and unskilled employees, although in this case the sectors III, IV and VI are also closely related to these indicators. These results indicate that a spatial subdivision of labour market areas may lead to different conclusions for labour segments compared to a more aggregate analysis (although the different set of segmentation indicators may also play a role).

A comparison of the results of Fig. 7 and Fig. 8 shows that the close agreement between the clothing industry and the textile industry in the Eastern Mining Area does no longer exist at the aggregate regional scale of South Limburg. The opposite holds true for the cluster composed of sectors I and II. Therefore, the general conclusion may be drawn that a spatial subdivision is extremely relevant, because the degree of segmentation is co-determined by the spatial scale of analysis.

Another important conclusion which can be drawn from Fig. 7 and Fig. 8 is that the primary sectors (I, II, III) are not clearly distinguished from the secondary sectors (IV, V, VI). Segmentation turns out to be a multidimensional phenomenon which can hardly be described by means of a one-dimensional classification principle. The results clearly demonstrate that the assumption of a dual labour market subdivided into a primary and secondary segment is unvalid. The wide variety of factors determining discrepancies at the labour market preclude a clear demarcation of segments into 2 distinct subsets. Therefore, the general idea of a multidimensional segmentation is much more realistic than the assumption of a dual labour market. Unfortunately, the data currently available did not allow us to perform the analysis of the dynamics of the regional labour markets. This is the subject of further research.

References

Arntzen, J.W., Regionaal Beleid in het Herstructureringsgebied Zuid-Limburg, Free University, Amsterdam, 1978 (mimeographed).

Bartels, C.P.A., Economic Aspects of Regional Welfare; Income Distribution and Unemployment, Martinus Nijhoff, The Hague/Boston, 1977.

Button, K.J., Urban Economics, MacMillan, London, 1976.

Cain, C.G., The Challenge of Dual and Radical Theories of the Labour Market to Orthodox Theories, The Economics of Labour, American Economic Association, vol.65, 1975, pp.16-22.

Cain, C.G., The Challenge of Segmented Labour Market Theories to Orthodox Theory, a Survey; Journal of Economic Literature, vol.14, 1976, pp.1215-1257.

Delft, A. van and P. Nijkamp, Multi-criteria Analysis and Regional Decision-making, Martinus Nijhoff, The Hague/Boston, 1977.

Doeringer, P.B., and M.J. Piore, Internal Labour Markets Manpower Analysis, D.C. Heath, Lexington, 1971.

Edwards, R.C., M. Reich and D.M. Gordon (eds.), Labor Market Segmentation, D.C. Heath, Lexington, 1975.

Gordon, D.M., Theories of Poverty and Underemployment, D.C. Heath, Lexington, 1972.

Heijke, J.A.M., and R.J.M. Maas, De Arbeidsmarkt in Model, Netherlands Economic Institute, Rotterdam, 1978.

Hordijk, L., and P. Nijkamp, Estimation of Spatial-Temporal Models, Spatial Interaction Theory and Planning Models (A. Karlqvist et al., eds.), North-Holland Publ. Co., Amsterdam, 1978, pp.177-200.

Lloyd, P.E. and P. Dicken, Location in Space, Harper and Row, London, 1977.

Mincer, J., The Distribution of Labor Incomes: A Survey with special reference to the Human Capital Approach, Journal of Economic Literature, vol.8, 1970, pp.1-26.

Martens, A., De Destructuratie van de Arbeidsmarkt, Sociologische Gids, 1977, nrs. 1 and 2, Boom, Meppel, pp.118-136

Miron, J.R., Job-search Perspectives on Migration Behaviour, Environment and Planning A, 1978, vol. 10, p. 519-535.

Mok, A.L., Is er een Dubbele Arbeidsmarkt in Nederland?, Pre-adviezen aan de Vereniging voor de Staathuisbondkunde, Martinus Nijhoff, Den Haag, 1975, pp.145-160.

Nijkamp, P., and W.M. van Veenendaal, A Multiattribute Analysis of Spatial Choice Behaviour, Research Memorandum, no.1978-13, Dept. of Economics, Free University, Amsterdam, 1978a.

Nijkamp, P. and W.M. van Veenendaal, Psychometric Scaling and Preference Methods in Spatial Analysis, Research Memorandum, 1978-3, Dept. of Economics, Free University, Amsterdam, 1978b.

Nijkamp, P., and J.H. Voogd, The Use of Psychometric Techniques in Evaluation Procedures, Papers of the Regional Science Association, 1979 (forthcoming).

Osterman,P., An Empirical Study of Labor Market Segmentation, Industrial and Labour Relations Review, vol.28, July 1975, pp.508-528.

Phelps, E.S. et al., Microeconomic Foundationsof Employment and Inflation Theory, MacMillan, London, 1970.

Piore, M.J., The Dual Labor Market, Problems in Political Economy: an Urban Perspective, (D.M. Gordon, ed.), D.C. Heath, Lexington, 1971.

Piore, M.J., Notes for a Theory on Labour Market Stratification, Labor Market Segmentation, (Edwards et al., eds.), D.C. Heath, Lexington, 1975.

Ratajczak, D., A Generalized Specification of Regional Labor Markets, Economic Impact Analysis (S. Pleeter, ed.), Martinus Nijhoff, The Hague/ Boston, 1979, (forthcoming).

Roskam, E.E., Non-metric Data Analysis, Dept. of Psychology, University of Nijmegen, 1975 (mimeographed).

Schalkwijk, R.W.F. van, Arbeidsmarktsegmentatie, Economisch- Statistische Berichten, 1978, vol.63, nr. 3178, pp.1113-1117 and vol. 63, nr. 3179, 1140-1143.

Schoemaker, N., A.M. de Jong-van der Poel en R.W. Hommes, De Positie van de Vrouw op de Arbeidsmarkt, SISWO, Amsterdam, 1978.

Thurow, L.C., Educational Economic Inequality, The Public Interest, vol.28, 1972, pp.66-81.

Valkenburg, F.C. en A.M.C. Vissers, Theorie van de Dubbele Arbeidsmarkt, IVA-Tilburg, 1978.

Vietorisz, T., and B. Harrison, Labor Market Segmentation: Positive Feedback and Divergent Development, American Economic Review, vol.63, nr. 2, 1973, pp.366-376.

Vissers, A.M.C. et al., Sociale Ongelijkheid op de Arbeidsmarkt, Sociologische Gids, nrs. 1 and 2, Boom, Meppel, 1977, pp.34-57.

Vissers, A.M.C., Segmentering en Mobiliteit, Nederlandse Staatscourant, 11 March 1977, nr. 50, pp.6-7.

Voogd, J.H., On the Principles of Ordinal Geometric Scaling, Research
        Centre for Physical Planning, PSC-TNO, Delft, 1977.

Voorden, W. van, Institutionalisering en Arbeidsmarktbeleid, Samson, Alphen,
        1975.

Voorden, W. van, De dubbele arbeidsmarkt, meer matglas dan maatschappij-
        spiegel, Economisch-Statistische Berichten, vol.62, nr. 3135,
        1977, pp.1281-1285.

Voorden, W. van, Inzicht en Oordeel over de Theorie van de Dubbele Arbeids-
        markt, Economisch-Statistische Berichten, vol.64, 1979, nr .
        3196, pp.265-267.

White, H.C., Claims of Opportunity, System Models for Mobility in Organi-
        zations, Harvard University Press, Cambrigde, 1970.

Serie Research Memoranda:

1977-1   L. Hordijk, P. Nijkamp,   Estimation of Spatiotemporal Models
                                         New directions via distributed lags
                                         and Markov schemes.

1977-2   P. Nijkamp,   Gravity and entropy models: The state
                                         of the art.

1978-1   J. Klaassen,   Valuta problemen in de Jaarrekening.

1978-2   P. Nijkamp, M.W. van   Psychometric scaling and preference methods
          Veenendaal,   in spatial analysis.

1978-3   P. Nijkamp, J. Spronk,   Interactive Multiple Goal Programming.

1978-4   P. Nijkamp, P. Rietveld,   New Multi Objective Techniques in
                                         Physical Planning.

1978-5   P. Nijkamp,   Decision Models for Planning against
                                         Stagnation.

1978-6   P. Nijkamp,   An Analysis of Interdependent Decision via
                                         Non-Linear Multi-Objective Optimization.
                                         A Theory of Displaced Ideals.

1978-7   P. Nijkamp,   Conflict Patterns and Compromise Solu-
                                         tions in Fuzzy Choice Theory.
                                         An analysis and application.

1978-8   J.D.P. Kasper,   De Bijdrage van Detailhandelsmarketing
                                         aan Maatschappelijke Welvaart en Welzijn.

1978-9   H.J. Blommestein, P.   A Multivariate Analysis of Spatial Inequa-
          Nijkamp, P. Rietveld,   lities.

1978-10   F. Palm and A. Zellner,   Large Sample Estimation and Testing Procedures
                                         for Dynamic Equation Systems.

1978-11   J.H.T.H. Andriessen,   Participatie, Invloed, Satisfactie en Groeps-
          P.A. Cornelis, H. van der   effectiviteit.
          Flier,   Een onderzoek bij deelnemers aan een bedrijfs-
                                         spel.

1978-12   W.van Lierop and   A utility framework for interaction models
          P. Nijkamp   for spatial processes.

1978-13   R.J. Joseph   Beschermingsconstructies in het huidige en
                                         komende vennootschapsrecht

1978-14   P. Nijkamp en   A multi-attribute analysis of spatial choice
          W.van Veenendaal   Behaviour

1979-1   A.A. Schreuder, Sunderman,   Werknemers en Soc. Jaarverslag
          Frans Blommaert en Hein
          Schreuder

1979-2   H. Schreuder,   De maatschappelijke verantwoordelijkheid van
                                         Ondernemingen.

1979-3   P. Nijkamp en P. Rietveld,   Multilevel Multi-objective Models in a
                                         Multiregional System.