

High-level consumer services in polycentric urban regions: hospital care and higher education between duplication and complementarity

Evert Meijers

Delft University of Technology
OTB Research Institute for Housing, Urban and Mobility Studies
P.O. box 5030
2600 GA Delft
The Netherlands
Tel.: +31 (0)15 2787892
e.meijers@otb.tudelft.nl

Paper presented at the 45th Congress of the European Regional Science Association – Amsterdam, 23-27 August 2005

Abstract

The paper explores developments in the spatial-functional structure of polycentric urban regions. Suggestions have been made that a network model of spatial organisation holds for such a regional clustering of cities. An important characteristic of this networked urban structure is the development of complementary relationships among centers and cities. The paper addresses the question whether cities in polycentric urban region complement each other in terms of the consumer services they host. The paper presents the results of an analysis of the micro-level strategies of actors in the hospital care and higher education sector in order to explore whether such complementary relationships are developing. In other words, can urbanization economies also be organised in polycentric urban regions?

Keywords: Polycentric urban regions; Urban networks; Complementarity; Hospitals; Higher Education

JEL classifications: R12, I18, I28, I11, I21

Acknowledgement

The author would like to thank Hugo Priemus and Marjolein Spaans for their helpful comments. The research on which this article is based is funded by the Delft Centre for Sustainable Urban Areas research programme within Delft University of Technology, and by the Habiforum Foundation's research programme 'System innovation urban and regional land use and area development' (SRG).

High-level consumer services in polycentric urban regions: hospital care and higher education between duplication and complementarity

1. Introduction

In an article in *Architectural Record* in 1964, the influential American architect and planner Stein summarised his ideas about what he and Lewis Mumford termed ‘The Regional City’, their ideal pattern for the building of future cities as well as for the redevelopment of that era’s metropolises:

“1. A regional city will be a constellation of moderate-sized communities, separated by great open areas but bound closely together by townless highways. ...

2. It will be planned, developed and operated as a regional entity.

3. Working places will be distributed in numerous towns and open places....

4. The open areas between towns, while serving for spacious recreation, will be used mainly for farms, woods and grazing....

5. The towns in a regional city will have varied functions, character, forms and sizes. Each will be large enough to support all the day-to-day activities and equipment of a contemporary American community. All towns will be small enough to foster local loyalty and pride, as well as closeness to country-side.

6. The total population of a regional group of towns and farms will be adequate to utilize and support central facilities equivalent to those provided by a great metropolis of today. This includes the best of universities, hospitals, museums, libraries, laboratories, wholesale markets, business centers as well as auditorium, symphony hall, theatres and an equivalent of the “great white way.”

7. These main central facilities will be in various towns, each of which will serve one or more at most a few related functions. Thus traffic loads will be limited and balanced and the deadening congestion of the obsolete metropolitan centers will be done away with.

8. The time distance to all its main centers from any part of a regional city will be less than that from vast outlying areas of a present-day sprawling metropolis to its congested multi-purpose center. This is possible because the greater part of the

journey will be by townless highways, safely speeding through open country, with adequate terminals in each town.” Stein (1964:205-206).

Stein has worked on a variety of towns, but his ideal type blueprint for the Regional City, meant to replace the famous Garden City concept (Howard, 1902) on which it builds, was never wholly realised. However, almost a century later – Stein and Mumford had been working on the Regional City concept since the 1920s (Parsons, 1998) – his ideas seem more alive than ever before. Unwittingly, his blueprint for the ideal metropolis has been embraced by a wide variety of planners and regional developers trying to develop what they often label ‘urban networks’: clusters of proximally located cities together allegedly providing for agglomeration economies on the regional level. Such clusters of cities appear as planning concepts in planning and urban and regional development policies in a wide variety of European countries including Belgium (‘urban networks’), Denmark (polycentric ‘National Centres’), Estonia (‘urban networks’), France (‘*réseaux des villes*’), Germany (‘*Städtenetze*’; some of the ‘*Metropolregionen*’), Greece (‘Twin poles’), Italy (‘*reti di città*’), Ireland (‘linked gateways’), Lithuania (‘Metropolis Vilnius-Kaunas’), the Netherlands (‘urban networks’), Poland (‘*duopols*’) and Switzerland (‘*vernetzte Städtesystem*’) (Meijers, 2005). In the literature, the label ‘polycentric urban regions’ seems to have become most common (Kloosterman and Musterd, 2001; Davoudi, 2003; Parr, 2004), though a diversity of other, largely synonymous concepts can be found, for instance ‘multicore city-region’ (Westin and Östhol, 1994), ‘network cities’ (Batten, 1995) and ‘polynucleated metropolitan regions’ (Dieleman and Faludi, 1998). Kloosterman and Lambregts (2001) define the polycentric urban region as a collection of historically distinct and both administratively and politically independent cities located in close proximity and well connected through infrastructure.

Obviously, there is a difference in terms of genesis between the concept of the polycentric urban region and Stein’s Regional City. Polycentric urban regions have evolved in time as a result of increasing functional relationships between the constituent cities, whereas a Regional City would result from an integral planning design. However, in terms of spatial-structure characteristics, both concepts hold the same ideal configurations. Stein makes two main assumptions in this respect. First of all, he believes that the mass or support present in the polycentric Regional City is equivalent to those generated by monocentric cities, which would result in a similar presence of consumer and business amenities/services. Second, he assumes that these consumer and business services are dispersed across the constituent cities or towns in such a way that each one of them hosts some, but not the same, regionally relevant

services, thus making the cities or towns complement one another. Late contemporaries of Stein have provided circumstantial evidence for the actual existence of such polycentric urban regions of which their spatial-structure complies with these assumptions. This includes Burton (1963) who developed the concept of the 'Dispersed City'. He observed patterns of functional specialization, most notably in retail, between similar-sized, close-by but physically separate cities in southern Illinois. Another example, on a much higher scale, is the 'Megalopolis', a term coined by the French geographer Gottmann for the urbanized Northeastern Seaboard of the United States. He claimed that the range of more or less comparably-sized cities between Boston and Washington should be considered one functional entity in which the cities perform complementary roles due to their functional specialization (Gottmann, 1961).

This paper explores these spatial-structure characteristics of polycentric urban regions. The next section presents contemporary views and knowledge on the spatial-structure of polycentric urban regions, addressing also both Stein's assumptions relating to the support of regionally relevant consumer/business services and their dispersal leading to complementarity. The focus in the remainder of the paper will be on the latter assumption: complementarity. The question is explored whether cities in polycentric urban regions complement each other in terms of consumer services. Developments within two sectors belonging to the consumer-services sector will be analysed: the hospital care sector (section four) and the higher education sector (section five). In geographical terms, the analysis focuses on the Randstad region in the Netherlands, by many considered a classic example of a polycentric urban region (Hohenberg and Lees, 1985; Van der Knaap, 1994; Batten, 1995). Section three introduces the analysis.

2. Towards a networked urban structure

The contemporary debate on the spatial-functional structure of urban regions focuses on the question whether we are witnessing a transformation that is generally labelled as 'from hierarchy to network'. Hence, the focus in this debate is on the relationships between the cities. Interurban relationships have long been defined in terms of hierarchy, which can be traced back to the work of Christaller (1933) and Lösch (1941) on central place theory. In central place theory great emphasis is put on the so-called vertical relationships between different classes of central places (cities). When higher-order goods and services cannot be provided by a city of a certain class, because its population (including its hexagonal hinterland) does not meet the minimal demand necessary for this provision, then this city

must obtain these goods and services from the nearest more populous central place which does meet the threshold requirement. This results in one-sided vertical interdependency relationships between different, hierarchically-linked classes of central places. Horizontal relationships between cities in the same class (thus of similar size) are non-existent according to this theory in its most rigid form. The idea of hierarchy can be considered as part of central place theory's conceptual core, resistant to changes (Camagni, 1993) and therefore still considered valid today.

However, more recently it has been argued that these hierarchical relationships are being replaced, or at least supplemented by other types of relationships. For instance Pred (1977), who analysed the spatial structure of multi-locational organizations, argued that hierarchies are linked to functions rather than cities as for each function the hierarchy may be different. Pred terms this 'asymmetrical' as opposed to the symmetrical organization of spatial structures according to central place theory. This means that interurban relationships may also exist between comparably sized cities, thus being of a horizontal nature.

These horizontal type relationships have attracted increasing interest in the last decade and half. This is fuelled by the rise of the metaphor of the 'network' in the social sciences and its more recent application in the spatial sciences, which provides a fruitful inspiration base for exploring relationships between all kinds of actors, phenomena and elements, including cities. Several authors have considered ways of translating findings of the network behaviour of firms to clusters of cities and the relationships between them (Camagni, 1993; Batten, 1995). Drawing such an analogy between the organization of firms and territorial systems is not undisputed. For instance, Dupuy (1992, in Pumain, 1992) speaks of a 'contamination' of the connotations associated with the notions of network and hierarchy in the organization of firms or of institutions. Pumain (1992) suggests that this analogy ignores the dynamic dimension of urban systems. Urban systems do not reflect the current conditions of the spatial division of labour, but should be seen as products of an historical evolution. Pumain argues that the main forces that shape the evolution and have so-far led to a hierarchical organization of urban systems, have not changed deeply. These forces include an agglomeration principle for activities and population, relations of competitiveness between cities and space-time contraction effects. However, Camagni argues that if the shape of the urban hierarchy is determined by the interplay of forces like economies of scale, minimum efficient production size, demand density and market size, as in the Christallerian and Lösschian models, than it could well be the case that other production forces working at the micro-economic and micro-territorial scale of the firm may be considered as the driving forces of the new 'network'

paradigm (Camagni and Salone, 1993). Drawing on the logics behind the spatial behaviour of firms, Camagni draws an analogy in three types of networks between cities in which the same efficiency mechanisms play a parallel role (Camagni and Salone, 1993: 1058-1059):

- a. Hierarchical networks: vertical networks among centers which control, in a hierarchical way, the market areas of goods and services or of production inputs. An example is the territorial hierarchy of public administration.
- b. Complementarity networks: Networks based on economies of vertical integration and made up of specialised and complementary centres, interconnected through market interdependencies; the inter-urban division of labour assures a market-area wide enough for each centre.
- c. Synergy networks: Networks based on network externalities and made up of similar and co-operating centres. Examples include networks between cities strong in financial activities, or tourist centres that are part of typical tourist itineraries.

Although it can be applied to hierarchies (a.), Camagni feels that the network metaphor is more appropriate when dealing with complementarity or synergy between cities (b. and c.), which is expressed in the following definition of city networks (Camagni, 1993:74): “City-networks are systems of relationships and flows, of a mainly horizontal and non-hierarchical nature, among complementary or similar centres, providing externalities or economies respectively of specialization/complementarity/spatial division of labour and of synergy/cooperation/ innovation.” Batten (1995:313) also emphasizes complementarity and co-operation: “A network city evolves when two or more previously independent cities, potentially complementary in function, strive to cooperate and achieve significant scope economies aided by fast and reliable corridors of transport and communications infrastructure.”

The emphasis on new, network-like relationships between cities has led to a model of the spatial-functional structure that could be labelled as a ‘network model’ (Batten, 1995; Van der Knaap, 2002). The model is essentially opposite to the central place model, while it fits Stein’s ideas on the Regional City very well. The features of this network model, or a networked urban structure, are (see also Batten, 1995; Van der Knaap, 2002):

- Overlapping functional hinterlands of cities or centers, resulting in functional integration
- Complementarity, linked to functional specialization of cities or centers;
- Size and function of a city or center are relatively disconnected;

- Both vertical and horizontal spatial relationships, the latter of which are assumed dominant.

Oft-mentioned examples of regions in which this network model would be present include many polycentric urban regions, but the Randstad region in the Netherlands serves as one of the more classic examples. Camagni and Salone (1993) and Van der Knaap (1994) stress that the region is particularly characterised by complementary relationships. An analysis of economic profiles of the main cities within this region showed that they perform distinct roles, each of them specialising in either commercial services (Amsterdam), manufacturing and transport (Rotterdam) or public administration (The Hague) (Meijers, 2005). However, at the same time, this analysis demonstrated that the extent of complementarity in general economic profiles is diminishing at a relatively fast pace. Before presenting our analysis of complementary relationships in the Randstad, we first briefly address the viewpoints in the literature on the two assumptions on spatial-functional structure put forward by Stein and which are related to the issue of complementarity.

Support for high-level consumer and business services

Many advanced or rare high-level services need a considerable minimum market size as regards both demand for the services offered and, in particular, the supply for the necessary human capital, while at the same time, these functions need good connections and access to communication networks (Capello, 2000). Cities provide for such urbanization economies, but to what extent are they organised in a polycentric urban region? Alonso (1973) has introduced the concept of 'borrowed size', which means that when cities are located close together and are well connected, they can host urban functions normally found only in larger cities, such as high level consumer and producer services, because the support base is larger given the vicinity of more cities. Stein assumes in a similar way that there is no difference between monocentric and polycentric urban regions. However, it seems unlikely that polycentric urban regions are able to provide the same critical mass as monocentric urban regions. Parr (2004) points in this respect at the need for longer travel flows, longer commodity flows and less convenient flows of information in polycentric urban regions. Moreover, it should be reckoned that 'some of the advantages of urban size stem from the nature of the metropolitan environment, and are related to such factors as density, proximity, face-to-face contact, informal structures, unplanned interaction, etc.' (Parr, 2004:236), and consequently hold less for polycentric urban regions. At the same time, it's distinct spatial-functional structure may entail also some advantages, such as the nearness of open, green

areas and in particular relatively less agglomeration diseconomies such as congestion, pollution and high prices etc. However, those who commute daily in archetypical polycentric urban regions as the Randstad or the RheinRuhr Area know that ‘safely speeding through open country’ between the cities while enjoying the country-side, as Stein envisioned it, is an illusion most of the time. However, strong empirical evidence, for instance comparing the amount of high-level consumer and business services of a polycentric urban region with the amount of the same services in a comparably-sized monocentric urban area has not yet been provided.

Complementary dispersal of high-level consumer and business services

The cities constituting a polycentric urban region often share a long history of rivalry and competition. It has been suggested that interurban competition leads to duplication rather than complementarity: “The most oft-noted drawback of inter-territorial competition is serial reproduction, the imitation and replication of the same ideas from place to place” (Malecki, 2004: 1112). Cities tend to market the same kind of images (Holcomb, 1994) and copy the same forms of urban redevelopment, innovations and investments that have proved to make particular cities more attractive (Harvey, 1989), which ultimately means that no city really benefits, but all lose valuable resources.

One of the main ideas behind the advancing of the concept of polycentric urban regions is to overcome such destructive competition between cities. Often the development of regional organising capacity is encouraged, that is, the ability to regionally co-ordinate developments through a more or less institutionalized framework of co-operation, debate, negotiation and decision-making in pursuit of interests at the regional scale (Meijers and Romein, 2003). Such frameworks are of course best organised bottom-up, thus initiated by the cities making up the polycentric urban region themselves, though central government incentives can foster this development, for instance in France where strategic projects – so-called ‘project territories’ developed by local partnerships – are eligible for central funding. Within such meeting platforms, regional coordination can be used to foster complementarity (Meijers and Romein, 2003). However, whether or not complementarity develops with regard to high-level consumer services and business services is often not in the hands of public policy-makers, but can be explained by analysing the micro-level behaviour of firms. Camagni and Salone (1993) and Meijers (1999) have found a rise of complementary relationships among firms indeed. This paper will further explore such micro-level behaviour by focusing on two types of

institutions providing high-level consumer services, namely the hospital care sector and the higher education sector.

3. Research approach

Complementarity results from differentiation between centers or cities in terms of urban functions, while these urban functions should be provided to (partly) the same geographical demand market (Meijers, 2005; Ullman, 1956). To give some examples in terms of hospitals and higher education, complementarity means that a number of hospitals provide for different medical specialisation, or specialise in different kinds of treatment whilst serving more or less the same region. Two universities complement one another when they provide for different study programmes while recruiting their students from more or less the same region. Hence, our research is focused on analysing the aspects of differentiation and of the origins of hospital patients and students. As regards the aspect of differentiation between hospitals, we focus on the differentiation in types of hospital functions provided, while for the higher education sector we focus on differentiation in the offer of full-time study programmes.

The Dutch hospital care system consists of academic hospitals, general hospitals and categorical or specialized hospitals as well as private hospitals. The academic hospitals, of which there are eight in the Netherlands, deliver very specialized treatment for complicated disorders, for which they often have a ‘last resort’ function, though they also provide for general hospital care in their region. Categorical or specialized hospitals provide specialist medical care in one type of medical specialization, for instance rehabilitation or dialysis. This care is provided at 93 locations in the Netherlands. However, the biggest group of hospitals are the general hospitals providing for a large variety of medical specialist care in their region. Private hospitals have played a minor but slightly increasing role in the Dutch health care system so far. They generally provide for not too complex medical care. Obviously, these various types of hospitals complement one another as they are focused on different types of patients. In our analysis, however, we focus on the general hospitals. No general datasets displaying aspects of complementarity are available in the Netherlands. Therefore, we gathered information during a series of interviews with managers of hospitals located in the South Wing of the Randstad as well as in the province of North Brabant. In addition, we conducted a literature review.

Since 2002, the Netherlands’ education system is based on a three-cycle degree system, consisting of a bachelor, master and PhD degree. The Netherlands has a binary system of

higher education, which means that there are two types of programmes: research-oriented education (*wetenschappelijk onderwijs*, WO), traditionally offered by research universities and leading to bachelor and master's degrees, and professional higher education (*hoger beroepsonderwijs*, HBO), traditionally offered by *hogescholen*, or universities of professional education leading to bachelor's degrees. We included both types of higher education in our analysis of complementarity, treating them as separate groups. We included both funded publicly and privately funded institutions. For this analysis it was possible to use a data-set provided by the public agency that implements government policies, the Informatie Beheer Groep. This dataset allowed for a quantitative analysis using correspondence analysis techniques from which a complementarity ratio was inferred. In addition, we carried out some interviews with public sector officials and managers of large universities of professional education to learn more about the micro-level strategies of the public sector and institutions for higher education behind these numbers. We further completed our analysis with a literature review.

Macro-micromodel

As an analytical framework for the research we apply a micro-macro scheme (Coleman, 1990). This scheme disentangles macro and micro dimensions of our problem. Our research question of whether or not the urban structure with regard to high-level consumer services is developing towards complementarity is obviously phrased on a macro-level. Also, at a macro-level, the current spatial-functional structure of polycentric urban regions, societal processes as well as the institutional and policy context provide opportunities and constraints to the behaviour of hospitals and institutions for higher education at the micro-level. In other words, they define the choice-set from which the actual behaviour of hospitals and institutions for higher education evolves. The combined effect of this micro-level behaviour then has consequences at the macro-level. This is exactly what we are interested in, as we want to know whether the micro-level behaviour of hospitals and institutions for higher education results in a trend towards complementarity in polycentric urban regions. In our discussion of the micro-level behaviour we therefore address two issues: the spatial and institutional context providing the behavioural conditions for hospitals and institutions for higher education, and, their actual behaviour as regards the organisation in space of hospital care and the dispersal of study programmes over the institutions for higher education. Finally, in the concluding section 6, we will analyse the impact of this micro-level behaviour on the spatial-functional structure of polycentric urban regions.

4. Hospitals

Macro-level context

Traditionally, the role of the government in hospital care is to facilitate and to set conditions for the hospital care sector that is for the rest particularly organized. These conditions relate to the quality and accessibility of hospital care and in particular also to control of the costs of hospital care. Van der Lee (2000) distinguishes three phases in the involvement of the government in the hospital sector. Up to 1974 this involvement is limited to 'facilitating'. In this period the hospital care sector expands considerably, both in terms of the number of hospitals as in terms of their capacity. Between 1974 and 1988 the government strengthens its grip on the hospital sector, focusing on increasing the scale of hospitals and reorganizing the sector as the available capacity, in terms of the number of hospital beds, far exceeds the demand, and hence, burdens the budget. The central government from now on needs to grant a permit for building or renovating hospitals, which provides an instrument to limit the capacity. Naturally, the budget was more limited than the demand, which required a prioritising in which building plans that led to a reduction of capacity were favoured. Furthermore, a plan was developed to directly intervene in the capacity of hospitals, including the closing down of a large number of them. Though this plan was eventually not implemented given the commotion it caused, it provided a clear signal to the hospital care sector that reorganisation was needed. This stimulated further scaling-up through mergers between hospitals. Another incentive for merging was provided in the shape of a new system of financing that clearly benefited larger hospitals. Next to size, this system couples also the actual care and cure functions of the hospital to the budget it receives. The scaling-up, coupled with concentration, led to a diminishing of the number of hospitals from 221 in 1954 to 197 in 1970 (Boot, 1998), while 86 were still left in 2005. Moreover, these hospitals have scaled-up considerably in terms of the number of beds provided. Between 1990 and up to 2002, the number of small hospitals (<199) and relatively small hospitals (200-399) declined from 79 to 40, while the number of large hospitals (>600) grew from 19 to 30 (Prismant, 2002). From 1988 on, the involvement of the government is more reserved, and more issues are left over to the market, though a little less when it comes to managing the costs of hospital care. Next to the traditional rationales behind government involvement, additional policies of the government include favouring the development of networks among institutions for care and cure regionally, thus including hospitals and other kinds of health care institutions. Hence, this is a matter of vertical integration. Of relevance is in particular also a renewed

recognition of the role of small hospitals in ensuring good accessibility to hospital care. It seems that a further concentration of hospitals is unwanted given the norms for accessibility employed by the central government. The strong instruments favouring mergers of small hospitals have been dismantled and instead, small hospitals that are essential in terms of meeting the norms with regard to access to emergency care (less than 45 minutes) are entitled to additional funding in order to overcome their typical problems mostly relating to the limited availability of staff which endangers the continuity of good care (Hoogervorst, 2003). Also from the viewpoint of introducing more free market competition in the hospital care sector is a further merging and concentration of hospital care unwanted, as this leads to regional monopolies. A recent inventory by the Netherlands Competition Authority (NMA, 2004) concludes that hospitals are to a large extent free in determining the quantity, composition, shape and quality of the care they provide, but are less free as regards the price-making process. For that reason, the government recently introduced more freedom in price-making for a part of the elective care, making up some 10% of the total care provided by hospitals. This all means that from now on mergers between hospitals are treated in a similar way as between firms. This recently resulted in a negative judgement about an intended merger between two hospitals in the Gooi area around Hilversum, as this would hamper competition.

Furthermore, the central government keeps a strong grip on the supply of top-clinical care functions including for instance organ transplantations, neurosurgery and in-vitro fertilisation. Rationales behind this regulation are the safeguarding of the quality delivered, efficiency and a proper application in terms of medical and ethical aspects. The regulation takes the shape of granting permits.

While the government obviously has left its mark on the Dutch hospital care sector through a sort of 'framework control', it should also be acknowledged that in particular decisions relating to the spatial dispersal of hospital care are taken by the hospitals themselves. It has been private incentives that have determined the spatial dispersal of hospitals in the first place, and today this is still practically the same as the hospital institutions themselves decide on closing down hospital locations, on engaging in co-operative partnerships or mergers, on concentration or deconcentration of hospital functions, or on relocating hospital functions over several locations of the same institution (College Bouw Ziekenhuisvoorzieningen, 2000).

Micro-level behaviour

The behaviour of hospitals can be explained by various rationales, including the maximising of quality in health care, the realisation of a certain volume in health care as well as maximising the turnover (Den Hartog, 2004). In addition, Boot (1998) explains the behaviour of hospitals as a pursuit of maximising the number of medical specialisations and provided by the hospitals. In the Netherlands there are about 30 acknowledged medical specialisations and providing them all would mean that the hospital has reached the maximum in size possible, as the number of beds they are allowed to have is linked to the provided medical specialisations. To realise this growth in specialisations and hence in the number of beds, the hospital needs a larger hinterland. This brings a territorial dimension to the competition between hospitals. Hinterlands widen through mergers, which is one of the explanations for the many mergers that have taken place in the hospital sector. Other motives to engage in mergers include the premium set by the government on merging (the fact that larger hospitals receive disproportional more budget), survival, which holds in particular for small hospitals, the assumption that larger hospitals can better deal with increasing uncertainty, for instance in the light of the introduction of more market competition, and a more strategic motive, namely the possibility to achieve otherwise not realizable options such as new buildings, or investments in medical techniques and capital-intensive medical equipment (Boot, 1998; Niesen, 1992; Rotting and Veenendaal, 1993). These mergers have often led to concentration of the two or more involved hospitals on one new location (after all, through regulation of the central government, building was only possible when coupled with a merger). All these mergers have more or less rationalized the spatial dispersal of hospitals in the Netherlands.

The relevance of all these mergers for the aspect of complementarity is that since recently a new trend can be witnessed. No longer do merging hospitals concentrate their activities at one place, but the multi-location hospital is becoming an increasingly widespread phenomenon. While in 1990 only 41 of the 128 general hospital organisations had more than one location (Nienoord-Buré and Damen, 1992), the 86 hospital organisations that exist in 2005 have spread their activities over 168 locations. Since recently, even more than half of all organisations has two or more locations (see Table 1).

Table 1. Number of locations of general hospital organisation in 2005.

Hospital organisation	1 location	2 locations		3 locations			4 locations				5 locations				
	none	none	1	none	1	2	none	1	2	3	none	1	2	3	4
of which 'buitenpoli'															
Number	38	15	13	2	6	2	2	2	2	-	-	-	3	1	
Total	38	28		10			6				4				

Sometimes, next to a traditional general hospital, the other location is a so-called '*buitenpoli*', that is a location for ambulatory care during office hours. More often, however, the other location also provides clinical functions. In that case, hospital organisations have a choice between having two or more locations offering the same care and cure as before, or relocating the care and cure functions over the locations so that they complement one another. The most occurring example of this is that an organisation makes a difference between the hospital functions of its locations on the basis of the type of care a patient needs. These differing types of care include for instance emergency care, plan-able or elective care and high-frequent care for chronic patients. Quite a number of hospital organisations have chosen to concentrate complex and emergency care on one location and plan-able, elective care on another. This could be labelled as functional specialization. So, multi-location hospitals have a choice between different location-models.

Which model they choose after the merger depends on a number of factors and hence, is not necessarily the ideal model envisaged beforehand. First of all, physical possibilities at the current locations play a role. Often, one or more locations do not have room to host the patients normally visiting the other location, if that one is to close down. Financial matters play an important role as well. New development of a hospital is costly and often the existing locations have not been depreciated fully in economic and technical perspective. The regulations of the government with respect to building sometimes make new development impossible. One can also imagine that for some reasons of efficient operational management, concentration is the most favourable situation, for instance because facilities for laboratories and diagnostics, radiology etc. can be used in the most efficient way. However, it may also prove to be very efficient to concentrate for instance plan-able care on one location, so that specialists and staff get more practiced and specialized and hence more people can be treated in a shorter period of time. A factor that should not be underestimated is also the opinion of the medical specialists within the merging hospitals. Multiple locations provide for certain opportunities, in particular when a choice is made for functional specialisation of the locations. However, such profiling also brings some practical difficulties along, for instance

the necessity to travel among the locations. Finally, competition with other hospital organisations plays a role. When closing down one location would mean a loss of hinterland and thus patients to another hospital organisation, then closing down is simply no option. In case the organisation has more or less a monopoly in the region, concentration on one location may be more feasible.

The outcome of the balancing of all these factors in the decision-making process increasingly is the specialization of different locations in certain hospital care functions. In particular in strongly urbanised city-regions, where multiple hospital organisations co-exist close to each other and competition for hinterland is fierce, closing down of locations is often not an option. In these regions, for instance in the Randstad, we can also note the opening of a large number of *buitenpoli's*, which should be considered outposts safeguarding or extending the hinterland. When competition is fierce and the multi-location model is a necessity, it makes sense to give distinct, complementary profiles to the locations as in that way, the organisation benefits most of the potential advantages of the merger. For instance, when we consider the eight hospitals in the South Wing of the Randstad that following a merger in the last fifteen years have multiple locations, three of them will concentrate on one location in the near future (of which two hospitals only have locations within the same city and hence face less competition), while four of them deliberately have chosen to give distinct profiles to their locations on the basis of different types of care (plan-able, elective care versus complex and emergency care). The other hospital continues its pre-merger distinction in care for children at one location and care for adults at the other.

A recent survey (Ecorys-NEI, 2003) among 780 adults that had needed hospital care in the last two years learned that not everyone really chooses a particular hospital as in 25% of the cases the choice was wholly made by the general practitioner who refers to a medical specialist, or by the medical specialist self in the case when respondents received medical specialist treatment already. For the remaining 75%, the most important factors that influence their choice are the expertise of the medical staff and travel time. Additional factors include the information provided, the treatment by the staff in their contact with the patient and the length of the waiting list for certain medical interventions. The level of amenities provided by the hospital, the comfort, visiting times and freedom of movement for the patients are factors of minor importance, while the ideological or religious philosophy hardly matters. Interestingly, some 40% of the respondents would prefer getting treatment in a considerably more distant hospital if they can get treatment much sooner than in the nearest-by hospital. Of course, the willingness to travel very much depends on the care needed. For elective, plan-

able care the willingness to travel is much larger than for emergency care or chronic care. Moreover, it appears that in general young people are more willing to travel than older people. Profiling locations means that for some types of hospital care, patients cannot longer get help from the nearest-by hospital location. Except for the cases in which emergency care units were relocated, this has caused only limited commotion. Travel distances in the Randstad and the province of North Brabant seem to be still acceptable to most people.

5. Higher education

Macro-level context

The involvement of the government in education is constitutionalized, though the higher education sector is relatively more autonomous than sectors at lower levels. Next to direct involvement of the government in the spatial dispersal of study programmes across the institutions, there are also more general policies of relevance, in particular those that determine the scope of the playing-field left to the institutions for higher education. In general, up to about 1985, developments in education were tightly under control by the central government. Then the paradigms of deregulation and increasing autonomy took over. For this, it was deemed necessary that the management competencies and capabilities of in particular universities of professional education were raised and scaling-up was the means to achieve this (Noordhof, 1998), while this would also increase efficiency. To stimulate this scaling-up, the central government decreed a minimum size of 600 students for universities of professional education, introduced a financial system that turned out positively for large institutions while also increasing the autonomy of institutions, for instance to engage in mergers. The scaling-up in the sector of universities of professional education was tremendous. In 1980 there were 353 of such universities for professional education with an average size of 370 students; in 2000 there were only 56 of such institutions left, and the size averaged 4460 students. Scaling-up in the sector of research universities was more limited, the 13 publicly funded universities did not engage in any mergers or co-operation, although the average student population raised from 10275 to 13500 in 2000 (Onderwijsraad, 2004). The process of deregulation seems to have come to an end now that more recently central steering has increased. This is evidenced by the imposition of the bachelor-master system following the Bologna agreement and more rigorous quality control of existing study programmes and the accreditation of new study programmes.

When we focus more directly on the study programmes, it should be mentioned that in the Netherlands, the study programmes differ mainly in terms of content, less in terms of standards and even less in terms of the approach to education (Onderwijsraad, 2005). In terms of standards, except for the difference in research universities offering both bachelors and masters degree courses and the universities of professional education offering just bachelors degree courses so far, the standards are pretty egalitarian. Approaches to education have hardly differed, but in recent years the need for more differentiation has become more evident given the growing diversity of the student population.

The Dutch central government has to accredit a proposal submitted by an institution for a new study programme leading to a bachelor's or master's degree, irrespective of whether this concerns an entirely new study programme or the addition of a study programme at a particular institute that is already given elsewhere. In the process of accrediting a new study programme, the central government is assisted by a special agency that tests whether the programme satisfies certain quality standards. If it does, this warrants the right of awarding recognised diplomas and for granting financial assistance for students. In addition, if a study programme is also to be funded by the government, the Ministry of Education tests for what is called 'macro-efficiency' using criteria such as innovativeness, demand by employers for graduates with that particular education and also the existing dispersal of similar study programmes across the country as they try to avoid harmful effects on the existing education infrastructure. Sometimes proposals for new study programmes do meet quality requirements, but do not pass this test for 'macro-efficiency' indeed. Next to new education, the government is also able to intervene in the current dispersal of education. During peer-visitation, the existing study programmes are examined using criteria mainly related to quality and less to considerations that could be labelled as 'spatial efficiency'. Nevertheless, the central government is able to intervene in the spatial dispersal of education across the country. However, whether or not they do test for macro-efficiency is very much dependent on the government in office. The number of either accredited newly developed study programmes or enlargements of the number of institutions where a certain study programme is given remained limited to about 80 in the period from 1993 up to 1998. After that, a more liberal approach was adopted and in just three years some 250 new study programmes were registered. Recently, the central government retraced their steps towards a more reserved approach, testing more rigorously for quality and macro-efficiency.

Micro-level behaviour

Despite the involvement of the central government outlined before, the institutions for higher education in the Netherlands are rather autonomous, certainly compared to neighbouring countries (OECD, 2004; Onderwijsraad, 2005). This autonomy concerns particularly financial matters, but also spatially relevant decisions such as the discontinuance or opening of establishments of an institution in other places and co-operation or mergers with other institutions. One aspect of the behaviour of universities of professional education is that many have merged together to scale up. While this has taken place mostly within the same city-regions, also some very large institutions have evolved from merges spanning for instance the entire Randstad region (e.g. the institution called hogeschool Inholland) or large parts of the provinces of North Brabant and Limburg (e.g. the institution called Fontys Hogescholen).

Important for the behaviour of institutions is the competition for students, as the number of students successfully finishing their studies determines their share of the public budget for education. Though through merges a certain extent of competition has been eliminated, there have continued to be a couple of institutions competing in each region for students so that absolute monopolies have been avoided. An important aspect in this regard is the willingness of prospective students to travel for education. Here, large differences exist between students of universities for professional education and students of the traditional research universities. While some 75 % of students of the latter move to the city-region where they study to live in students rooms, some 53% of the students of universities of professional education prefer to stay at home with their parents (IB-groep, 2005). One can imagine that this percentage is even higher for first-year students. This means that in particular students at universities of professional education still tend to choose the nearest-by institution that offers the study programme they want, even though Dutch students have free travel permits. For managers of such institutions it is hardly possible to intervene in the spread of study programmes over their establishments, as relocating study programmes from one place to another does often mean a loss of students. So, even after merges, study programmes that are similar but given in different establishments are not spatially clustered. Rather, given this reluctance of prospective students to travel, they often try to expand the offer of individual establishments with study programmes already given at other establishments of the same institution. This is a relatively inexpensive way to attract more students as it does not involve development costs, though one can argue that this may lower the number of students of the same programme at the other establishments. This also holds for the development of new study programmes that often, despite their fashionable labelling, do not differ much from existing study programmes.

And, when a truly new study programme is developed and appears successful in attracting students, other institutions tend to copy it soon (Adviescommissie onderwijsaanbod, 2003). Obviously, competition between the universities for professional education leads to duplication rather than complementarity.

The competition between research universities takes a different shape. In the Netherlands, prospective students make a trade-off between the constraints imposed by distance and apartment rents on the one side and the attraction of universities and the regions in which they are located on the other. The attractiveness of universities is determined by the scope in terms of study programmes offered and the city-region is more attractive when there is a relative abundance of socio-cultural and leisure amenities (Sa *et al.*, 2004). Of the 13 publicly funded universities in the Netherlands the specialized universities of Delft (technology) and Wageningen (agriculture) as well as Maastricht (educational philosophy) all have a national recruitment market, whereas the others are more regionally oriented (Sa *et al.*, 2004). Obviously, compared to universities of professional education, in the competition for students distance plays less a role. Until recently, universities have pursued rather stand-alone strategies in this competition, not involving in major co-operation partnerships, not to mention merges. However, it should be mentioned that more recently the three technical research universities in the Netherlands agreed on co-operation that brings together their master's degree courses in one Graduate School. This means also offering joint courses and jointly developing new national master's degree courses, particularly in the 'new technologies'. The ambition is to increase the number of national and international students in technology and a more efficient use of resources. Obviously, it remains to be seen how effectively this plan is implemented.

Complementarity ratio's in higher education

We now adopt a more quantitative approach to the issue of complementarity in higher education by analysing the offer of study programmes in the Randstad region using correspondence analysis techniques. For an extensive discussion of correspondence analysis see Greenacre (1993) and Clausen (1998). This method presents an indicator for complementarity, which we call the complementarity ratio. This ratio is based on the total inertia statistic. The total inertia is a measure of the extent of differentiation in a group of, in our case, institutions for higher education. The interesting thing about this statistic is that when all these institutions would provide exactly the same study programmes, the total inertia would be 0. When all institutions would provide study programmes that would not be given at

another institution, then the total inertia would be equal to the dimensionality of the problem (in practice often the number of institutions –1). In order to enable comparisons between sets of institutions that differ from each other in terms of the number of institutions included, we normalized the total inertia statistic by dividing it by the maximum total inertia that could have been achieved (thus, by the number of dimensions). This then results in our complementarity ratio's, which would be 0 when all institutions for higher education had exactly similar study programmes on offer, while it would be 1 when all institution would offer unique study programmes. So we have scores on a scale from 0 to 1, or in other words, from maximum duplication to maximum complementarity.

For the analysis we used datasets provided by the Informatie Beheer Groep. This public organisation keeps listings of accredited higher education provided by each university or universities of professional higher education. This so-called CROHO registration was provided for the academic years 1993-1994, 1997-1998, 2001-2002 and 2005. Datasets were defined for the Randstad region as a whole and both its constituting wings, the North Wing and the South Wing (see Figure 1).

Given the differences outlined before, we distinguished between research universities (Table 2) and universities for professional education (Table 3). Furthermore we used different sets of institutions defined by the region in which they are located. Furthermore, we included two examples of universities of professional education that have establishments all across the Randstad region (Inholland; merged in 2001) and several cities in North Brabant and Limburg (Fontys; 1996) (Table 4).

Table 2. Complementarity ratio's for research universities in the Randstad, 1993-2005.

<i>Research universities</i>	1993-1994	1997-1998	2001-2002	2005	Trend
Randstad	0,609	0,610	0,603	0,616	+1,1%
North Wing	0,747	0,747	0,741	0,745	-0,3%
South Wing	0,817	0,798	0,830	0,860	+5,3%

During the 1993-2005 period, the differentiation in study programmes between the nine research universities in the Randstad nor in the six of them in its constituent North Wing did remain quite stable. However, the three universities in the South Wing, already quite distinct from each other, differentiated more, leading to more complementarity.

Figure 1: The Randstad and the North and South Wing

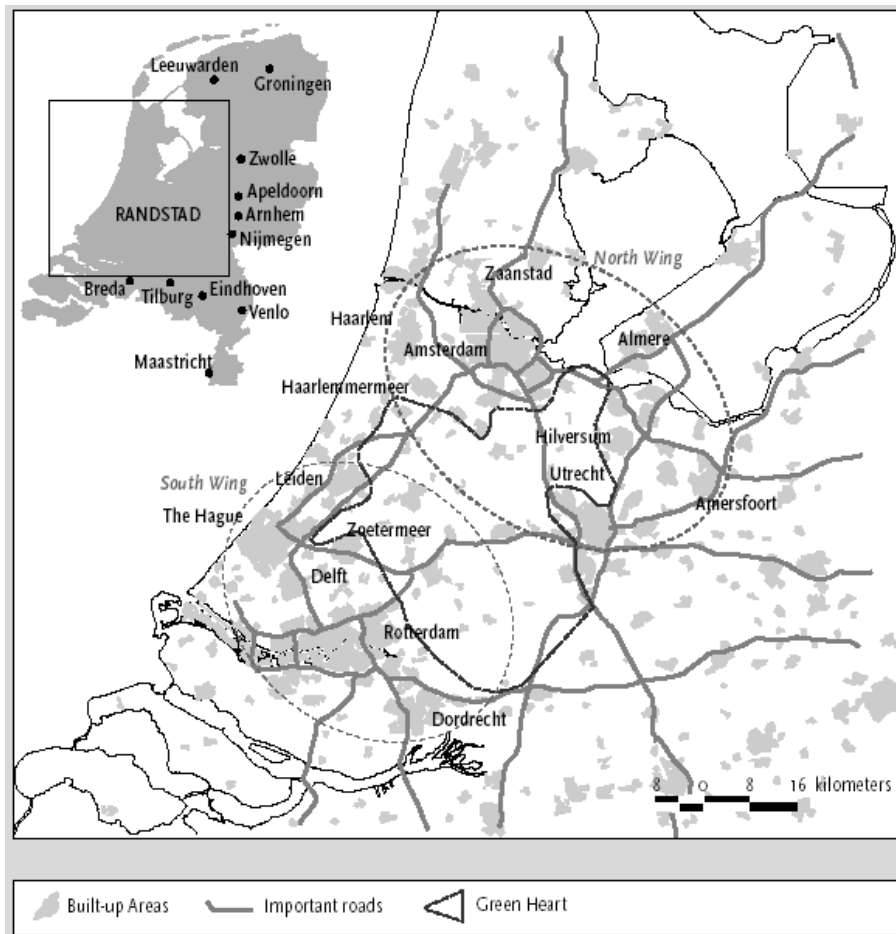


Table 3. Complementarity ratio's for universities of professional education in the Randstad, 1993-2005.

<i>Universities of professional education</i>	1993-1994	1997-1998	2001-2002	2005	Trend
Randstad	0,354	0,396	0,415	0,435	+22,9%
North Wing	0,473	0,521	0,497	0,574	+21,4%
South Wing	0,519	0,512	0,543	0,602	+16,0%

There was a clear upward trend in the complementarity between universities of professional education in the North and South Wing and hence also in the Randstad.

Table 4. Complementarity ratio's for large-scale universities of professional education resulting from a merger, 1993-2005.

<i>Universities of professional education</i>	1993-1994	1997-1998	2001-2002	2003	2005	Trend
Inholland	0,737	0,716	0,635	0,671	-	-9,0 %
Fontys hogescholen	0,617	0,616	0,599	-	0,572	-7,3 %

Large-scale mergers between a multitude of universities of professional education do not necessarily imply a rise in complementarity as the most prominent examples in the Netherlands witnessed a diminishing complementarity ratio. However, the most recent trends diverged as Inholland saw its ratio rise slightly while the decrease of this ratio accelerated in the case of Fontys hogescholen.

These quantitative results are roughly conform our analysis of the micro-behaviour of institutions for higher education in the sense that not much change is noted for the research universities, while also merging does not necessarily lead to less duplication, as we noted yet. However, the correspondence analysis also shows that the complementarity between different universities of professional education is rising.

6. Conclusions

It is generally assumed that in polycentric urban regions a network model of spatial organisation is developing. An important characteristic of this model is that the centers and cities within such a region complement each other. This paper argued that trends with respect to complementarity should be analysed at the micro-level, that is the behaviour of individual actors. Two sectors providing consumer services at a supra-local level were analysed: the hospital care sector and the higher education sector.

Both sectors share important characteristics. In the first place, both sectors are privately managed. However, as a large part of their activities is financed by public (education) or collective (hospitals) budgets, the central government applies a sort of framework control, based on norms of accessibility, quality and efficiency. In the last two decades, the involvement of the government in both sectors has become more distant, relating to the new

paradigms of deregulation and increasing autonomy. For the hospital sector, government explicitly tries to introduce more market competition. In the past, more or less similar government instruments have been applied to both sectors. This includes instruments that foster scaling up (such as a financial system that benefits larger organisations, and instruments that hamper the functioning of, or even ban, small organisations). Mergers in particular have been stimulated. In both sectors, many mergers have taken place in the past decades, though for the higher education sector, this only holds for universities of professional education.

Even though the macro-context for the hospital and higher education sectors are quite similar, the actual micro-level behaviour of hospitals and institutions for higher education diverges. This holds in particular for the allocation of functions over multi-location hospitals or multi-location universities of professional education that resulted from mergers. While a large part of the multi-location hospitals choose to give a more distinct profile to their locations leading to complementarity, multi-location universities of professional education rather tend to duplicate functions between their locations. Part of the explanation for this lies in the fact that the costs that duplication bring along are much smaller for universities of professional education than for hospitals. It is relatively inexpensive to offer a study programme that has already been developed elsewhere at another location. Hospital care is much more capital-intensive and hence duplication is a much more inefficient choice. However, also the different nature of the services provided and hence of the competition between hospitals and higher education plays a role. Hospital care is generally a necessity, while studying in higher education results from a deliberate free choice.

The competition for students and patients has a strong territorial dimension. It is this competition that leads to multi-location hospitals and universities of professional education in the first place. When many competing institutions are close, closing down some of the locations of hospitals or universities of professional education means a loss of patients or students. In that case, there is no other choice than maintaining multiple locations. For hospitals, it is a too large financial burden to continue providing similar hospital care at all locations for a long time. Efficiency-mechanisms force to specialize the different locations. As said, these efficiency-incentives are different for universities of professional education. As many of their students prefer to stay at home with their parents, they often choose the nearest-by location that offers the programme they want to study. Hence, it makes sense for universities of professional education to offer as much as reasonably possible study programmes as close as possible to prospective students. This means that in this case competition leads to duplication.

Do the trends in both sectors lead to a development from duplication to complementarity in polycentric urban regions? The first thing to mention in this respect is that the sectors analysed here do not necessarily function on the scale of polycentric urban regions. In the competition for students, some of the research universities compete on a national or even international scale, while others compete more for large regional markets. Universities of professional education in general do not compete on the scale of the Randstad region. The North and South Wings probably provide more accurate proxies, depending on how frequent a certain study programme is offered. Finally, the general hospitals compete more on the scale of city-regions such as The Hague and environs or Rotterdam and environs. Notwithstanding this variety in spatial scales, we used the Randstad and its constituent wings as the geographical framework for our analyses, given the assumed development of complementarity in the literature. Having said this, the question still is whether we see a trend towards complementarity. We answer this question cautiously with yes. A trend towards more complementarity is most evident in the hospital sector, where in many cases multi-location hospitals decide to reallocate their hospital functions over the locations - often in different cities - leading to complementarity. Also our quantitative analyses revealed an increase in the complementarity ratios in the Randstad and its both Wings for universities of professional education, averaging around 20% since 1993. So, complementarity developed between different universities of professional education, not within the individual organisations. The extent of complementarity between the research universities in the Randstad and its Wings remained fairly stable. Also here, however, we can notice the development of cooperation networks on a nation-wide scale, trying to exploit complementarities of the technical universities. Therefore, it seems that polycentric urban regions are slowly developing into complementary urban networks. This means that urbanisation economies in polycentric urban regions are increasing.

Literature

- Adviescommissie Onderwijsaanbod (2003) *Eindrapport 1993-2003*. Den Haag: Adviescommissie onderwijsaanbod.
- Alonso, W. (1973) Urban Zero Population Growth, *Daedalus* 109, 191-206
- Batten, D.F. (1995) Network Cities: Creative Urban Agglomerations for the 21st Century, *Urban Studies* 32, 313-327.
- Boot, J.M. (1998) Schaalvergroting en concentratie in het Nederlandse Ziekenhuiswezen, *Bestuurskunde*, 7 (1): 28-37
- Burton, I. (1963) A restatement of the dispersed city hypothesis, *Annals of the Association of American Geographers*, 63, pp. 285-289.

- Camagni, R. (1993) From city hierarchy to city networks: reflections about an emerging paradigm, in Lakshmanan, T.R. and Nijkamp, P. (Eds) *Structure and change in the Space Economy: Festschrift in honour of Martin Beckmann*, pp.66-87. Springer Verlag, Berlin.
- Camagni, R. and Salone, C. (1993) Network Urban Structures in Northern Italy: Elements for a Theoretical Framework, *Urban Studies* 30, 1053-1064.
- Capello, R. (2000) The City Network Paradigm: Measuring Urban Network Externalities, *Urban Studies* 37, 1925-1945.
- Christaller, W. (1933) *Die zentralen Orte in Süddeutschland* (Jena, Gustav Fischer Verlag). (1966 translation by Baskin).
- Clausen, S-E. (1998) *Applied correspondence analysis: an introduction*, Sage University Papers Series on Quantitative Applications in the Social Sciences, 07-121. Sage, Thousand Oaks.
- Coleman, J.S. (1990) *Foundations of Social Theory*. Cambridge, Mass.: Belknap Press of Harvard University Press.
- College Bouw Ziekenhuisvoorzieningen (2000) Uitvoeringstoets op hoofdlijnen inzake gewenste ziekenhuispreiding, Utrecht: College Bouw Ziekenhuisvoorzieningen.
- Davoudi, S. (2003) Polycentricity in European Spatial Planning: From an Analytical Tool to a Normative Agenda, *European Planning Studies* 11, 979-999.
- Dieleman, F.M. and Faludi, A. (1998) Polynucleated Metropolitan Regions in Northwest Europe: Theme of the Special Issue, *European Planning Studies*, 6, pp. 365-377.
- Dupuy, G. (1992) *L'urbanisme et les réseaux* (Paris, Armand Colin).
- Ecorys-NEI (2003) Vraagfactoren ziekenhuizen, eindrapport. Rotterdam: Ecorys-NEI.
- Gottmann, J. (1961) *Megalopolis, The urbanized Northeastern Seaboard of the United States*. New York: The Twentieth Century Fund.
- Greenacre, M.J. (1993) *Correspondence analysis in practice*. London: Academic Press Limited.
- Hartog, den (2004) *Effecten van marktstructuur en gedrag op het resultaat van algemene ziekenhuizen*. Tilburg: Universiteit van Tilburg.
- Harvey, D. (1989) From managerialism to entrepreneurialism: the transformation of urban governance in late capitalism, *Geografiska Annaler* 71B, 3-17.
- Hohenberg, P.M. and Lees, L.M. (1985) *The Making of Urban Europe: 1000-1950*. Cambridge, MA: Harvard University Press.
- Holcomb (1994) City make-overs: marketing the post-industrial city, in Gold J.R. and Ward S.V. (Eds) *Place Promotion: The Use of Publicity and Marketing to Sell Towns and Regions*, pp. 115-131. Wiley, Chichester.
- Hoogervorst, H. (2003) *Beleidsstandpunt bereikbare ziekenhuiszorg*, Tweede Kamer der Staten Generaal, vergaderjaar 2003-2004, Dossier 27295/56. Den Haag: Ministerie van Volksgezondheid, Welzijn en Sport.
- Howard, E. (1902) *Garden Cities of To-morrow*, London: Swan Sonnenschein.
- IB-Groep (2005) <http://www.ib-groep.nl/> (June 3, 2005).
- Kloosterman, R.C. and Lambregts, B. (2001) Clustering of Economic Activities in Polycentric Urban Regions: The Case of the Randstad, *Urban Studies* 38, 717-732.
- Kloosterman, R.C. and Musterd, S. (2001a) The Polycentric Urban Region: Towards a Research Agenda, *Urban Studies* 38, 623-633.
- Knaap, G.A. van der (1994) *Ruimtelijke complexen en schaalspanning op de stedenring*, EGI-onderzoekspublikatie 19, Erasmus Universiteit Rotterdam, Rotterdam.
- Knaap, G.A. van der (2002) *Stedelijke bewegingsruimte, over veranderingen in stad en land*. SDU uitgevers, The Hague.

- Lee, C. van der (2000) *Ziekenhuisfusies, procesgang en resultaten: beschouwing vanuit enkele neo-institutionele en organisatiekundige theorieën*. Capelle a/d IJssel: Labyrinth Publication.
- Lösch, A. (1954) *The Economics of Location* (New Haven, Yale University Press). (translation of original 1941 publication).
- Malecki, E.J. (2004) Jockeying for Position: What It Means and Why It Matters to Regional Development Policy When Places Compete, *Regional Studies*, 38 (9): 1101-1120.
- Meijers, L.D. (1999) *Ruimtelijke netwerken van zakelijke dienstverlening*. Rotterdam: Erasmus Universiteit Rotterdam.
- Meijers, E. and Romein, A. (2003) Realizing potential: Building Regional Organizing Capacity in Polycentric Urban Regions, *European Urban and Regional Studies*, 10 (2), pp. 173-186.
- Meijers, E. (2005) Polycentric Urban Regions and the Quest for Synergy: Is a Network of Cities More than the Sum of the Parts? *Urban Studies*, 42 (4): 765-781.
- Nienoord-Buré, C.D. and Damen, K.A.M. (1992) *Functieprofilering bij meerlocatieziekenhuizen*. Utrecht: Nationaal Ziekenhuisinstituut.
- Niesen, L.M. (1992) Resultaten van ziekenhuisfusie, *ZM Magazine*, 8 (4): 116-120.
- Nederlandse Mededingsautoriteit (NMA) (2004) *Concurrentie in de ziekenhuissector, visiedocument*. Den Haag: NMA.
- Noordhof, H. (1998) Schaalvergroting in het hoger beroepsonderwijs, *Bestuurskunde*, 7 (1): 19-27.
- Organisation for Economic Co-operation and Development (OECD) (2004) *Education at a Glance*. Paris: OECD.
- Onderwijsraad (2004) *Bureaucratisering in het onderwijs*. Den Haag: Onderwijsraad.
- Onderwijsraad (2005) *De stand van educatief Nederland*. Den Haag: Onderwijsraad.
- Parr, J.B. (2004) The Polycentric Urban Region: A Closer Inspection, *Regional Studies* 38, 231-240.
- Parsons, K.C. (ed.) (1998) *The Writings of Clarence S. Stein: Architect of the Planned Community* (Baltimore, The Johns Hopkins University Press).
- Pred, A. (1977) *City-Systems in Advanced Economies* (London, Hutchinson).
- Prismant (2002) *Instellingen van intramurale gezondheidszorg, Basisgegevens per 1-1-2002*. Utrecht: 2002.
- Pumain, D. (1992) Urban networks versus urban hierarchies? *Environment and Planning A*, 24 (10), pp. 1377-1380.
- Rotting, W. and Veenendaal, W.H. (1993) Fusie: oplossing of valkuil? *Het ziekenhuis*, 23 (12): 558-564.
- Ullman, E.L. (1956) The Role of Transportation and the Bases for Interaction, in W.L. Thomas (Ed.) *Man's Role in Changing the Face of Earth*, pp. 862-880, Chicago: The University of Chicago Press.
- Sa, C., Florax, R.J.G.M. and Rietveld, P. (2004) Determinants of the Regional Demand for Higher Education in The Netherlands: A Gravity Model Approach, *Regional Studies*, 38 (4): 375-392.
- Stein, C.S. (1964) A regional pattern for dispersal, *Architectural Record*, September, pp. 205-206.
- Westin, L. and Östhol, A. (1994) Functional Networks, Infrastructure and Regional Mobilization, in Lundqvist, L. and Persson, O. (Eds) *Northern Perspectives on European Integration*, pp.43-57. NordREFO, Stockholm.