

6 Randstad Holland between functional entity and political desire

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Introduction

The attention given to the Randstad Holland as a key concept in urban and regional development strategies of the Dutch national government has come in waves over decades. The status of the Randstad concept largely depends on the ruling coalition in the Dutch parliament and can be explained by the location of liberal, socialist and confessional voters (Frieling, 2009). Liberal voters are overrepresented in the Randstad in general, with social-democrat voters being strongly present in the Randstad's major cities. Confessional voters are overrepresented in the areas outside of the Randstad and also in its Green Heart. Ideologically, and at risk of an overly simple generalisation, liberals and social-democrats favour an urban culture, in contrast to confessionals who prefer more orderly urban patterns and are more rooted in rural culture. Over the years, the Netherlands has been governed by coalitions involving changing combinations of two of these three parties, sometimes with additional smaller parties. Involvement of the liberals in these coalitions generally led to a fostering of the (economic) position of the Randstad in the Netherlands (national concentration), while involvement of the socialists particularly strengthened the position of cities within regions (regional concentration), and confessionals adhere to policies of dispersal, either at the national scale (when in a coalition with social-democrats) or at a regional scale (when ruling together with liberals). It follows that the Randstad gets most emphasis under liberal-social-democrat rule. It is less on the agenda under confessional-socialist rule, when instead the focus is more on the individual cities. As none of these coalitions tends to be in place for longer than eight years, it follows that attention to the Randstad, and how it is translated into policies, comes in waves.

However, the picture has become more complicated in recent years. The political landscape has become more fragmented and populist parties have risen to prominence, particularly those on the right of the political spectrum. These tend to get relatively many more votes from the southern, formerly catholic part of the country, as well as from particular neighbourhoods, suburbs or post-war satellite towns of the larger cities of the Randstad

(De Voogd, 2016). According to Rodríguez-Pose (2018), populist movements find their roots in places that feel or get told that they do not matter, which subsequently take ‘revenge’ through the ballot box. Even though right-wing populist parties address rather urban themes such as immigration and integration, they do challenge the urban cosmopolitan perspective dominant in larger cities and college towns in the Randstad. Coupled with their large support base also outside the Randstad, it follows that attention for the development of the Randstad as a whole will be limited, even though there will be attention for problematic neighbourhoods in its cities. While these parties have so far not joined a ruling coalition at the national level, they have drawn attention away from planning at a pan-Randstad scale.

Academics play a potential counterweight role to the dynamic interplay of political forces in that they can provide a more consistent rationale as regards the need and relevance of conceptualising the Randstad as a single entity or whether a focus on its main cities, or some of its neighbourhoods is more relevant. For sure, the functional rationality of the Randstad concept has been contested ever since it rose to prominence in public and policy circles in the 1950s (e.g. Werkcommissie Westen des Lands, 1958; Steigenga, 1972; Bours and Lambooy, 1974; Wagenaar and Van Engelsdorp Gastelaars, 1986; Brand, 2012; Maessen, 2013). Over many years, numerous academic studies have tried to shed light on these issues, and to some extent, their volume follows the political discourse as attention to the Randstad comes coupled with more research funding opportunities as well.

Some of the studies into functional coherence have been very influential to the political discourse. Arguably, the most influential one is a study by (the predecessor of) the Netherlands Environmental Assessment Agency (Ritsema Van Eck *et al.*, 2006) that concluded essentially that the Randstad was not a functional entity (see Chapter 7). It was the prelude to the ending of the period of renewed interest in the Randstad concept that had started with the rise of the Delta Metropolis Association at the end of the 1990s (see Chapter 11) and ended with the never-put-into-practice proposal for a Randstad Province in 2007 (CVR, 2007). In subsequent years, two new so-called ‘metropolitan areas’ were defined centred on Amsterdam (the so-called North Wing of the Randstad but excluding Utrecht) and Rotterdam/The Hague (the South Wing of the Randstad; see Chapter 12) partly because research had shown that these scales were more relevant functional entities than the Randstad as a whole (Van Oort *et al.*, 2013). Van den Berg (1957) and the 1966 Second National Report on Spatial Planning presented the North Wing and South Wing already as possible development entities; the North Wing also incorporating the cities of Utrecht, Amersfoort, Hilversum and Alkmaar and the South Wing also incorporating the cities of Leiden and Dordrecht.

It is interesting to note the difference in perspective for insiders and outsiders. While many public actors and residents in the Randstad identify and associate more with smaller spatial entities within the Randstad, outsiders tend

to see the region more often as a whole. In the rest of the Netherlands, the Randstad toponym sometimes denotes the (too) dominant economic and political power concentrated there. But many studies tend to consider the region as an entity (e.g. Hall, 1966; BBSR, 2011; see also various projects within the ESPON programme), with the associated advantage that this makes the region look more prominent in any competitive ranking of cities or regions.

The relevance of studies into functional coherence goes far beyond catering to political whims. Whether or not the Randstad is a functional entity is believed to be critical to its economic, social and environmental performance (Shachar, 1994; Lambooy, 1998; Meijers, 2007a; OECD, 2007). More generally, it has been suggested that flows, and especially a city's embeddedness in these flows, are critical to understanding its performance (Taylor, 2003; Hall and Pain, 2006; Neal, 2013). As regards this embeddedness, often, an analogy is drawn with firm networks: the potential importance of global economic networks in shaping a firm's competitiveness and performance potential has often been mentioned (e.g. Malecki, 2002; Tracey and Clark, 2003). Parallel to these debates, it could be argued that networks between cities, also on the regional scale as for example in the Randstad, are crucial in enhancing its competitiveness. Obviously, without interactions and flows between the Randstad cities, it is hard to imagine that they would gain 'world city' status (Hall, 1966; Shachar, 1994), or that such a loose collection of medium-sized and small cities would be able to organise the agglomeration benefits of a single, large metropolis (Meijers and Burger, 2010). Indeed, a recent study of 117 polycentric urban regions reveals that they are able to organise more agglomeration benefits when they are more strongly functionally and politically integrated (Meijers *et al.*, 2018).

In this chapter, the central aim is to scrutinise the wide variety of studies that have addressed the question of whether the Randstad is a functional entity or not. At first sight, this may appear to be a fairly simple question. However, in practice, we must address theoretical, conceptual and methodological questions that potentially have a strong influence on the answers. The aim of this chapter is to unravel such theoretical, conceptual and methodological issues by discussing existing studies of functional relationships in the Randstad as well as their findings. This will unveil the relational complexity of the Randstad.

The next section comprises the main part of this chapter and presents a selection of some of the most important studies that have been exploring functional coherence in the Randstad at different points in time, culminating in an overview table in which their main characteristics are summarised. While this section is more of a descriptive nature, the section thereafter critically discusses the studies from a conceptual and methodological perspective. This final section considers general conceptual and methodological requirements that need to be adhered to when studying functional coherence in polycentric metropolitan areas such as the Randstad.

The Randstad: a coherent functional entity?

The rise of the Randstad as a territorial, policy and research concept

The Netherlands became a unified state in 1815, but resembled the former federation of provinces until the start of industrialisation. Over several decades, growth was located disproportionately in the entire Randstad. The Hague developed rapidly with the rise of central government and associated functions, the port of Rotterdam thrived, Amsterdam regained its prominence as a financial and colonial trade centre, while Utrecht's central location led to the establishment of many national services in that city (Atzema *et al.*, 1992). Thus, an economically thriving and politically important region in the West of the Netherlands was born. In a way, the development of such a polycentric system of cities is remarkable; as in the nineteenth century, the general trend in surrounding countries was that a primate city developed as countries became more centrally governed (Wagenaar and Van Engelsdorp Gastelaars, 1986; Brand, 2012).

There was a generally felt need to develop a name for this polycentric urban system. The earliest occurrence of the Randstad toponym in newspapers dates from November 1938 and paradoxically has its roots not in a debate that stresses its unity and coherence, but instead, is rooted in a competition between the main cities regarding the location of a national airport (Borger *et al.*, 2011: 87; Meijers, 2019). The national airline, KLM, was not in favour of Schiphol airport at Amsterdam, at that time a small airstrip, and instead favoured a new national airport to be located in the centre of the ring of cities in the West of the Netherlands, and this ring of cities was referred to as Randstad ('rand' means rim). Lobbying together with the city of The Hague, KLM propagated a location not far from Leiden. In the debate, a variety of other names also circulated like 'Zoomstad' ('Edge City'), but 'Randstad' surfaced as the most appealing toponym and quickly became part of the everyday vocabulary, as evidenced by its increasingly frequent appearance in newspapers (Burger, 2018), inside and particularly also outside the area.

After the Second World War, the territorial concept of the Randstad turned into a policy concept (Werkcommissie Westen des Lands, 1958), as growth management was deemed necessary given substantial population increases in the Randstad due to internal migration from rural areas, fuelled by mechanisation of work in agriculture (Lambregts and Zonneveld, 2004). While policy-makers proposed safeguarding the deconcentrated nature of the Randstad, they also foresaw that the Randstad cities would functionally become related to such an extent that the network of cities would be able to rival large metropolises such as London and Paris (Lambregts and Zonneveld, 2004).

Early observations¹

The entity of a network of cities in the Randstad was not yet in place in the 1950s. In his analyses of the Randstad cities, the geographer Keuning (1955)

concluded that the Randstad did not form an integrated urban system. Amsterdam clearly served a wider territory as a commercial and trade centre, but this area was by no means restricted to the Randstad, as the headquarters in the city directed operations in the whole country and the city formed a shopping centre for all Dutch. Rather, he discerned metropolitan areas centred on Amsterdam, Rotterdam, the Hague and Utrecht, while he also points to the city-regions of Leiden and Haarlem as distinguishable units. The pattern in the South Wing (a term already in use in the 1950s) of the Randstad was rather complicated. In addition to the industrial and transport-oriented cluster of activities extending from Delft up to Gouda and Dordrecht, he pointed to the important residential role of (parts of) The Hague and places adjoining such as Wassenaar and Voorburg for the high-level workers in the industrial and transport cluster around Rotterdam. Similarly, the area for which Rotterdam is the centre for services and amenities is different to the area of the industrial-logistical complex, as for example, Delft is more oriented towards The Hague. Likewise, he found that the labour market for the most highly skilled workers such as those working at the universities in Leiden and Delft easily covers the combined metropolitan areas of Rotterdam, The Hague and Leiden. If the Randstad were to be considered an entity, he posed that it would probably be in the area of international tourism, as the prime tourist attractions were concentrated in the area. The hierarchical orientation of flows is presented in Figure 6.1, which shows the spheres of influence of the major Dutch cities according to Keuning (1955).

Luning Prak (1960) made an early contribution in emphasising the value of the concentration of economic activities and agglomeration economies for welfare, arguing against a deconcentration of activities to more peripheral regions and cities which gained considerable political momentum in the late 1950s. Similarly, in Steigenga (1972: 157), the Randstad is introduced as a 'sympolis'. Building on Vance (1964: 89), a sympolis is suggested to work according to the principles of equality and concert, expressing the idea that 'each city in the urban region stands as a functional equal to all other, and that it is the collective and cooperative labors of the lot that give us our urban economy'. Also, an emphasis on equality and concert 'may overcome the implied dependence of the outer parts of the urban region on the centrally located core, a connotation that cannot be winnowed from the term metropolis'. Lambooy (1974) confirms this development view stressing functional and economic complementarities between urban regions in the Randstad.

Urban networks research programme

It was only at the end of the 1980s and beginning of the 1990s that there was a new upsurge in studies addressing the functional coherence of the Randstad (NEI, 1986; De Smidt, 1987; Stam *et al.*, 1988; Van der Knaap and Louter, 1988; Verroen *et al.*, 1988; Knol and Manshanden, 1990; Dieleman and Musterd, 1992). This rise was not a coincidence, as it came coupled with the publication of a new national spatial strategy called the Fourth Report on Spatial



Figure 6.1 Dutch cities and their sphere of influence in the early 1950s.

Source: Keuning, 1955.

Planning (Ministerie van VROM, 1988) in which the then-prevalent political ambition to spread development further over the country was abandoned. Instead, the focus turned to strengthening the Randstad area given trends such as internationalisation. Increased functional integration between the Randstad cities was considered an essential part of this and would also exploit the clear complementarities in economic profile of the cities. An interesting anecdote is that in the first 1988 version of this planning memorandum, the planners of the National Spatial Planning Agency introduced a new version of the Randstad which excluded Utrecht. The assumption behind this was that 'top functions' were concentrated in a much more confined area: the western part of the Randstad. The demotion of Utrecht met heavy political

opposition in and outside parliament and was dropped in later versions (for a full account of this battle, see Van Duinen, 2004; see also Chapter 11).

A new research programme – the ‘Urban Networks Research Program’ – was set up involving several Dutch universities (Kruyt *et al.*, 1987) and strongly supported by government funding. The outcomes were published in a special issue of the journal *Tijdschrift voor Economische en Sociale Geografie* (TESG) (Atzema *et al.*, 1992). In particular, the study by Cortie *et al.* (1992) focused on the question of whether the Randstad was a functional entity or not. The availability of flow data was an issue for these researchers, forcing them to limit their analysis to migration patterns and daily traffic flows. Descriptive statistics of flows between areas were presented, but the authors struggled with the question of which criterion to use to determine whether the Randstad was integrated or not. In their study, the level of flows within the Randstad was judged against the level of flows within the four largest city-regions, and whether intra-Randstad flows were stronger than between the Randstad and the rest of the Netherlands. While Cortie *et al.* emphasise the need to not just look at flows in terms of absolute numbers but also to control for the size of origin and the distance between them, they only controlled for the size of origin.

As regards migration patterns, it was concluded that migration between the city-regions of the four main cities was limited, and if there was migration, this was predominantly between suburban rings of different cities. In retrospect, one may wonder whether migration was an aptly chosen indicator. After all, if a change of jobs required a household to move house, this is probably more an expression of fragmentation (travel distances, times and costs being too high when commuting on a daily basis) rather than integration. One could even develop an opposing argumentation as the lack of intra-Randstad migration found by Cortie *et al.* could actually be an expression of integration: it shows that it is possible to cover the entire area without having to migrate.

The other indicator available was ‘daily travel patterns’ in terms of work-related trips (e.g. commuting and business trips), services-related trips (e.g. shopping) and leisure-trips (sports, culture and social visits, among others). Of these trips, work-related trips were over greater distances than the others. This appears to have changed (see Schwanen *et al.*, 2001). Leisure trips account for the largest share of trips and total distance travelled. As could be expected, an analysis of these trips indicated that functional coherence within one of the four city-regions was much stronger than between them. However, it was also shown that the number of trips between adjacent city-regions was higher, providing some evidence of integration at the scale of the southern and northern wing of the Randstad.

Overall, the conclusion was that ‘the Randstad cannot be taken as one fully integrated network of cities. It consists of four separate daily urban systems. At most two wings can be distinguished’ (Cortie *et al.*, 1992: 284), and this conclusion was similar to studies in the 1970s and early 1980s (Cortie and Ostendorf, 1986). The authors provide two explanations for the lack of coherence.

First, the internal accessibility of the Randstad would be insufficient to enable frequent pan-Randstad travel. Second, the complementarities of the cities would be too limited, which also makes the need for such pan-Randstad travel limited.

Focus on dynamics through time

In the 1990s, several studies were published that took a different approach by comparing functional patterns at multiple points in time, and in the case of Clark and Kuijpers-Linde (1994) by also comparing the Randstad to Southern California. By comparing 1980 and 1990 data on work trips, these authors counter the arguments for maintaining separate city-regions as done by Cortie *et al.* (1992) by pointing at the rising relative number of flows occurring between the four main Randstad city-regions (as well as the Green Heart). In particular, the number of flows out of The Hague, Rotterdam and Utrecht city-regions was increasing, and these were particularly oriented at the closest neighbouring city within the northern wing and southern wing, respectively. Trips from The Hague to Rotterdam increased 75%, the other way around, they almost doubled. Trips from Utrecht to Amsterdam increased by two-thirds over the 10 years and from Amsterdam to Utrecht by almost 50%. Remarkably, integration between the northern and southern wing decreased somewhat. Moreover, 'the evidence for an interconnected urban structure is as strong as in Southern California' (Clark and Kuijpers-Linde, 1994: 475). They make an interesting remark that 'now the issue is the equilibrium at which flows will stabilise' (Clark and Kuijpers-Linde, 1994: 475), which recognises that functional integration is not likely to increase forever, and which suggests that there may be some optimum level of functional integration.

A later study by Limtanakool *et al.* (2009) examines the 1992–2002 period, focusing on flows of people between daily urban systems (identified on the basis of commuting and migration data in Vliegen, 2005; see also Van der Laan, 1998). In the Randstad, nine daily urban systems were identified, in itself an indication of a lack of functional coherence, although these daily urban systems are located adjacent to each other, hence forming a continuous ring around the Green Heart. The study employs an urban systems approach using strength and symmetry of interaction to define the structure of the Dutch urban system. Spatial interaction is measured by commuting and leisure trips of persons. The authors find that the Netherlands urban system is composed of several smaller urban systems, and the Randstad stands out as an identifiable subsystem, in which stronger interaction occurs than in the other subsystems. This is at least partly due to a methodological choice to measure strength of a link between cities as a proportion of total interactions, meaning that mass of origin and destination (which are larger in the Randstad) are not controlled for.

In the 1990s, both Amsterdam and Utrecht started to attract more commuters from elsewhere, and in particular, the pattern of interaction within the

northern wing became more complex (notably in terms of leisure flows). An important conclusion drawn is that in the 1992–2002 period especially, commuting interaction between close-by daily urban systems became stronger, more symmetrical and more evenly distributed. Because of this, there appears to have been a rise of the Randstad north and south wing as relevant functional entities. Results for leisure flows gave little evidence of stronger, pan-Randstad integration.

A recent study by Kasraian *et al.* (2018) explored developments in travel behaviour in the Randstad over time (1980–2010). It found a rise in average daily distance travelled until the mid-1990s, which was however followed by a decrease up to 2010. This may suggest that the functional integration of the Randstad has become less strong in more recent periods.

Interlocking network model

The EU co-funded Interreg IIIb project Polynet of the early 2000s set out to explore functional relationships within eight mega-city regions in North West Europe, including the Randstad. Next to descriptive analyses of commuting flows, showing no integration at the Randstad scale, it also extended the interlocking network model of inter-city relations, originally devised to provide a descriptive analysis of how global and world cities are connected at the regional scale or ‘inter-locked’ with one another (Taylor, 2001) (see Hall and Pain, 2006; Hoyler *et al.*, 2008). The results are extensively discussed in Burger *et al.* (2014b).

The interlocking network model defines two cities as linked in a network to the extent that they host offices of the same firm, assuming that there is likely to be a flow of knowledge between different locations of the same firm. Applying this method, Lambregts *et al.* (2006) found that the strongest intra-firm linkages in the Randstad are between Amsterdam and Rotterdam, meaning that most firms have a simultaneous presence in both cities. Other dense connections include relationships between the four large anchors of the Randstad: Amsterdam, Rotterdam, The Hague and Utrecht. Smaller centres such as Alkmaar and Amersfoort also appear relatively well connected to the other Randstad cities studied, while the remainder cities are less well connected. Following this logic, it would seem that ‘a dense and well-spread network of business services flows exists between the main business service centres of the Randstad’ (Lambregts *et al.*, 2006: 142). However, based on a series of interviews with policy-makers, the authors of the Randstad study cast doubt over this initial interpretation: perhaps the findings signal

the existence of relationships at the pan-Randstad level, but simultaneously point at intra-regional fragmentation and ‘disconnectedness’. After all, from the practice among firms to have multiple offices in the Randstad area it may be derived that for many firms it is apparently not feasible

to service the entire area from a single office and hence that for many firms the Randstad falls apart into several, separate business markets.
(Lambregts, 2009: 135)

In other words, the business services market in the Randstad appears geographically fragmented, an interpretation which is contrary to the standard interlocking network model perspective that the Randstad is strongly integrated.

Light-intensity at night

A very different perspective is taken by Florida *et al.* (2012). While their prime objective is to measure economic output by focusing on light intensity, they also identify metropolitan areas as completely contiguously lighted areas as seen from space at night. They do so using light emission data for the year 2000. Although no maps are made available, the population number of 7.62 million they found for the Amsterdam-Rotterdam-The Hague area suggests that this corresponds to a broad definition of the Randstad. Obviously, this method, which in many ways is a crude approximation of a functional area, does not allow identifying functional relationships between places.

Integration, specialisation and complementarity

The study that strongly criticised the rise of interest in governmental cooperation at a pan-Randstad scale in the early 2000s was undertaken by the Netherlands Environmental Assessment Agency (Ritsema Van Eck *et al.*, 2006; see also Chapter 7). The conclusion was that the widespread assumption in policy circles at that time that the Randstad was developing into or had already developed into a coherent functional entity characterised by specialisation, integration and complementarities, could not be empirically supported. These firm conclusions are based on a number of observations relating especially to specialisation and complementarities: the economic specialisation and socio-economic composition of cities are converging (in line with: Kloosterman and Lambregts, 2001; Meijers, 2007b), and complementarities (in the sense that specialisations in one place evoke interactions with places that lack these specialisations) with regard to industry and trade seem non-existent. In terms of trips for shopping Ritsema Van Eck *et al.* (2006) conclude that 90% of shopping trips take place within the own city-region and only 5% of shopping trips in another Randstad city-region, while the average distance for such trips is also hardly increasing. Also, input-output relations between firms in the central cities are substantial in absolute terms, but less than expected given their size. Ritsema Van Eck *et al.* (2006) continue by stating that functional coherence at a pan-Randstad level only holds for a limited number of activities, areas and sectors, and furthermore, in these niches, trends were not indicating a further strengthening of coherence.

These niches include commuting, as long-distance commuting was found to have risen, but still, 75% of workers did so in their own city-region. Yet, it is concluded that the Randstad is a relevant scale for the labour market, albeit not the most important scale. Another niche is ‘fun shopping’ in the northern wing, where specialisation of cities appears to lead to interaction (compare De Hoog, 2013 and Chapter 10 elsewhere in this volume).

In sum, the evidence for functional coherence found was not sufficient to consider the Randstad a functional entity nor is it one in the making. Rather, the report suggests that Amsterdam was, after more than a century, regaining (or continuing) its status as leading metropolis. The rest is history. Amsterdam withdrew from pan-Randstad co-operation platforms and instead, started its own ‘Metropolitan Region Amsterdam’ incorporating a large part of the northern wing, but not Utrecht. In response, Rotterdam and The Hague joined forces in the ‘Metropolitan Region Rotterdam-The Hague’ (see Meijers *et al.*, 2014 and Chapter 12).

In a follow-up to this project, and again using the data on input-output relations between firms operating in the Randstad and gravity models, Van Oort *et al.* (2010) concluded that there is a clear ranking of relations in the Randstad: intra-urban and suburban-core relations are stronger in magnitude than could be explained from the gravity variables mass and distances alone, while all inter-urban and core-suburban relations were clearly less than expected. Re-estimating the model while testing for inter-firm flows between municipalities with complementary sectoral specialisations did not alter the outcomes substantially. This suggests that the main Randstad cities (Amsterdam, Utrecht, Rotterdam and The Hague) still predominantly function as monocentric nodes without much division of flows based on economic complementarities for many inter-firm relationships (recall that half of all relations were with partners outside the Randstad).

Multiplexity and heterogeneity

More recently, researchers addressing functional coherence in the Randstad have drawn attention to the issues of *multiplexity* (Burger *et al.*, 2014a) and individual-level heterogeneity (Burger *et al.*, 2014b). Multiplexity refers to the situation where different types of functional linkages do not display a necessarily identical pattern. This means that a region can appear to be spatially integrated based on the analysis of one type of functional linkage, but loosely inter-connected based on the analysis of another type of functional linkage. In the case of the Randstad, it was found that input-output relationships, intra-firm relationships and business travel occur more on a pan-Randstad level than commuting, and much more than social, leisure or shopping trips which have a narrower spatial scope (Burger *et al.*, 2014a). In a follow-up study, it was also shown that individual-level heterogeneity plays a role. This means that, even though a similar type of flow may be taken into account, there may be a wide variety of spatial interaction patterns that

can be attributed to differences among people or firms. Burger *et al.* (2014b) demonstrate this for commuting and inter-firm relationships. Commuting patterns are strongly dependent on individual-level characteristics, such as gender, age, income, hours worked, education, having children or not and the type of household to which one belongs. For instance, young, higher-educated and higher-earning men generally tend to commute much more on a pan-Randstad scale than older, lower-education and lower-earning men. The same holds for women. But for them, having children limits their spatial scope. For firms, the odds of having buyer-supplier relationships at the regional scale of the Randstad were dependent on sector, establishment type, size and age of the firm (Burger *et al.*, 2014b).

The turn to 'big data'

Traditionally, it is rather difficult to obtain fine-grained data relationships between cities, but 'big data' is going to change this. An increasing number of resources is becoming available or can be made relevant to study functional coherence of metropolitan regions using, for example, community detection algorithms. A promising method to determine the relatedness of cities is the so-called 'toponym co-occurrence method'. This approach reconstructs the spatial organisation of a territory on the basis of co-occurrences of place names in a text corpus. Studying the relationships between all Dutch places with over 750 inhabitants (#1639) through counting co-occurrence of their names on all Dutch (.nl) websites, Meijers and Peris (2019) reconstruct the spatial organisation of the Netherlands for the year 2017. The residuals of applying a gravity model to this network of relationships can inform whether cities are more or less related with each other than could be expected given their sizes and the distance between them. Meijers and Peris (2019) establish that the relationships in the Randstad region are actually somewhat less strong than expected. Whereas the relation between Rotterdam and Amsterdam is the strongest in absolute terms, it happens to be somewhat less strong than expected (-2.8% to be precise). Within the Randstad region, The Hague stands out as a city that is more related to the other main Randstad cities (The Hague-Amsterdam: +10%; The Hague-Rotterdam: + 7%; The Hague-Utrecht: + 10%). The relations Amsterdam-Utrecht (-3%) and Utrecht-Rotterdam (-4%) are less strong than expected. Places that were particularly more weakly related to other cities than expected tended to be either relatively new suburban places near the main Randstad cities (Capelle aan den IJssel, Spijkenisse, IJsselstein, Hellevoetsluis, Almere), or older places that have always been in the 'agglomeration shadow' (see Meijers and Burger, 2017) of a larger close-by city (Vlaardingen near Rotterdam, Zwijndrecht next to Dordrecht) (Meijers and Peris, 2019). Table 6.1 summarises the findings of the overview of studies presented in this section. The next section elaborates and discusses these findings.

Table 6.1 Overview of studies into functional coherence Randstad

Period studied	Study	Main approach	Indicators and data	Methodological approach	Findings
1930s–1950s	Keuning (1955)	Define hinterlands of individual cities.	Travel patterns: observations	Mostly tacit knowledge.	Randstad fragmented into several separate urban systems (Amsterdam, Rotterdam, The Hague, Utrecht), although Amsterdam has a function as a national service centre. South wing of the Randstad presents a more complex functional pattern and some signs of integration on the (upper level of the) housing market and for higher education.
1970s–1980s	Cortie <i>et al.</i> (1992)	Comparing functional integration at different spatial scales.	Actual flows: migration; commuting & business trips; services trips; leisure trips.	Absolute flows standardised by size and origin.	Draws attention to multiplexity. Randstad is not integrated, but fragmented into four city-regions centred on Amsterdam, Rotterdam, The Hague and Utrecht. Limited evidence of increasing functional integration at the scale of the northern and southern Randstad wings.
1980s	Clark and Kuijpers-Linde (1994)	Dynamics in flows through time and comparison between regions.	Actual flows: work-related trips.	Relative distribution of trips out of city-regions over several destinations.	There is evidence for an interconnected urban structure in which functional relations are increasing, in particular at the scale of the northern and southern Randstad wings. These wings are becoming more separated from each other.

(Continued)

<i>Period studied</i>	<i>Study</i>	<i>Main approach</i>	<i>Indicators and data</i>	<i>Methodological approach</i>	<i>Findings</i>
1990s	Limtanakool <i>et al.</i> (2009)	Describing dynamics in urban systems over time.	Actual flows: commuting, leisure trips.	Changes in relative strength of flows between two places in relation to the total number of flows. Symmetry of flows (multidirectional).	The Randstad is an identifiable subsystem in the Dutch urban system. Commuting interaction between close-by urban systems became stronger, more symmetrical and more evenly distributed. Consequently, the northern and southern Randstad wings are becoming relevant functional entities. Results for leisure flows gave little evidence of stronger, pan-Randstad integration.
Early 2000s	Lambregts <i>et al.</i> (2006)	Identification of city networks derived from assumed knowledge flows between offices of advanced producer services (APS) firms.	Intra-firm networks: spatial distribution of offices of APS firms.	Interlocking network model.	Mixed interpretations of findings possible. Standard interpretation of the method suggests that the Randstad is strongly tied together by intra-firm (knowledge) flows. An alternative interpretation leads to opposing findings: that many APS firms have multiple offices in the Randstad suggests fragmentation rather than integration.
1990s–Early 2000s	Ritsema Van Eck <i>et al.</i> (2006); Van Oort <i>et al.</i> (2010)	Search for complementarities, understood as specialisation coupled with integration (interaction).	Actual flows: commuting; shopping; input–output relationships of firms.	Gravity models	The Randstad is not an integrated functional entity characterised by specialisation, integration and complementarities, and is also not developing in that direction. Randstad is composed of subsystems that are linked, but not integrated. City-regions provide for the most appropriate functional entity.

2000	Florida <i>et al.</i> (2012)	Defining metropolitan areas based on light intensity at night.	Light intensity: night-time satellite images.	Light emission thresholds based on American metropolitan areas applied globally.	Few details available. The 'Amsterdam-Rotterdam-The Hague' metropolitan area is identified, and its population number (7.62 million) suggests that this is based on a broad definition of the Randstad.
2000s	Burger <i>et al.</i> (2014a); Burger <i>et al.</i> (2014b)	Demonstrating multiplexity and individual-level heterogeneity.	Comparing functional patterns for different types of actual flows and per flow for different types of actors.	Gravity models, network density and visualisation. Comparing levels of integration at city-region scale versus Randstad scale.	Functional integration on a pan-Randstad scale is limited. Assessments depend on the lens through which it is assessed. Firm-related interactions occur more on a pan-Randstad scale than person-related interactions, but some trip motives (e.g. business trips and commuting) have a greater spatial scope than leisure or social visit trips. Individual's characteristics play an important role. Younger, higher-educated and higher-earning persons tend to operate on a much larger scale than those who are older, less educated and are earning less.
Late 2010s	Meijers and Peris (2019)	Assumption that probability of co-occurrence of place names in texts is higher when they are more related.	Retrieves co-occurrences of place names from large text corporate (often digital archives) and applies machine learning to classify these relationships.	Natural language processing, machine learning, deviations from gravity model.	Randstad is somewhat less coherent than could be expected given a gravity model for the entire Randstad. Provides detailed information on the embeddedness of individual cities in the Randstad.

Conclusion: relational complexity in the Randstad

The research question in this chapter was simple at first sight: is the Randstad a functional entity? The equally simple answer to this question is no. Studies focusing on different indicators of functional coherence tend to show that pan-Randstad functional integration is rather limited and generally point to the relevance of the city-regions centred on Amsterdam, Rotterdam, The Hague and Utrecht as more dominant functional entities, with some indication of an extension of these city-regions into the north wing and south wing of the Randstad (Keuning, 1955; Cortie *et al.*, 1992; Clark and Kuijpers-Linde, 1994; Ritsema Van Eck *et al.*, 2006; Limtanakool *et al.*, 2009; Van Oort *et al.*, 2010; Burger *et al.*, 2014a). It is rather striking that this conclusion was already drawn by Keuning and Van den Berg in the 1950s, Steigenga in the 1970s, Cortie *et al.* in the 1980s and Van Rossem (1994) and De Boer (1996) in the 1990s. The use of sophisticated measurement methods in the later decades has not changed this conclusion much. At the same time, some studies emphasise that the Randstad is an identifiable subsystem within the Netherlands (Limtanakool *et al.*, 2009; Florida *et al.*, 2012).

The more nuanced answer is that there is substantial relational complexity in the Randstad, and the answer to the question of functional coherence is very much dependent on the conceptual and methodological approach adopted by the researcher(s) as well as the data being considered. Conceptual approaches define the question of whether the Randstad, or any region, can be considered a functional entity. The first important question is whether the Randstad should actually function as if it were a daily urban system to consider it a functional entity. The choice to study daily flows such as shopping or commuting is obviously an often-implicit indication that the Randstad should be considered a daily urban system. But the alternative is to consider the Randstad more a 'weekly urban system' or perhaps even a 'monthly urban system'. A focus on non-daily flows, such as leisure flows, is perhaps more indicative. At the other end of the spectrum, a focus on migration is perhaps not good either, since the average frequency of moving house is every 10 years in the Netherlands.

This leads to the second issue, which is that it could be argued that some types of flows do not really indicate integration, but rather the opposite, fragmentation. This holds for migration, which could indicate that a region is not sufficiently linked by infrastructure and transit systems making it rather difficult to access the amenities of a place from the previous home. It also holds for the interlocking network model method, where the simple fact that firms in advanced producer services cannot serve the Randstad from one location, but need to establish several branches is rather an indication of fragmentation than integration through knowledge flows between these offices.

The third issue is that studies show that the Randstad has a kind of imbricated structure: close-by pairs of cities tend to show integration, making them all linked in a chain, but not necessarily individually. It is unclear how this should be addressed conceptually.

The fourth issue is that the question of whether a region is integrated or not is strongly dependent on the type of flow being studied (as a result of multiplexity), which necessitates that any answer should be based on analyses of multiple types of flows.

An issue that combines both conceptual and methodological choices is how the reference against which absolute patterns of flows can be judged is set: when is integration 'strong', 'weak' or 'less than expected'? For example, when 75% of people living in a city-region work in another one, then is this high or not? And what if 90% of these people shop in their own city-region? How do we evaluate this? We have seen studies that try to maximise internal coherence relative to external flows. This allows definition of a subsystem, but not the level of integration within it. A more common approach has been to compare the level of intra-city region flows with pan-Randstad flows. But was it really a surprise that such close-by ties were stronger than more distant ones? And can one really infer the conclusion from this that pan-Randstad integration is limited? A seemingly more objective method is to employ the gravity model, which at least controls for the mass of origin and destination, and the distance between them. But one factor is consistently overlooked, namely what Ullman (1956) many years ago defined as 'intervening opportunities' (after Stouffer, 1940): alternative sources of supply and demand. In a polycentric structure like the Randstad with its many cities, there are also many possible origins and destinations for flows. As in and outcoming flows are distributed over so many individual pairs of relations between cities, they can make these individual interactions appear weak when employing the gravity model, even though the sum of all in and outgoing flows can be substantial. It could well be that ignoring this particular feature of polycentric systems has led to a serious underestimation of flows in the Randstad. Finally, considering the evidence for individual-level heterogeneity, how correct is it to take averages of general flows and not take stock of characteristics of the firm or the person involved in the interaction?

Another methodological issue is whether one should not simply consider frequencies of interaction, but also try to give them a different weight. For instance, input-output relationships between firms could be given a weight based on the importance or value of what is being transferred. And, should we weigh the frequency of personal trips perhaps by the time spent at a location? Getting fresh bread from the bakery around the corner is perhaps something different than an afternoon of fun shopping in another city. One way to do so that has been used is to link interactions to specialisations and complementarities of cities. But here, the specialisation of a city has been judged relative to the whole set of other places in the Randstad, and not relative to an individual place; however, interaction is measured between places.

To conclude, we are not saying that the Randstad is an integrated functional entity. What we show here is that conceptual and methodological choices that have been made in many studies of functional coherence in the Randstad have the tendency to underestimate pan-Randstad coherence.

While there has been a search for truly objective methods to measure functional coherence, with big data and data science approaches sparking new hopes of doing exactly that, it could be argued that any method necessarily always involves some normative conceptual and methodological choices. The point is that these always need to be made explicit. As well as studying the question of whether the Randstad is functionally integrated, more time needs to be devoted also to the question of what is an optimal level of functional integration at a Randstad scale. The implicit idea that more pan-Randstad interaction is always better needs to be abandoned: there is a social, economic and sustainability dimension to such functional interaction that has not received full attention yet.

Note

- 1 This and some of the following subsections are a much elaborated version of Section 2 in Burger, Meijers and Van Oort (2014).

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