

## **Managing science cities spaces in wider urban hierarchies**

Reconciling knowledge-based and polycentric modes of urban development

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## Abstract

This paper explores polycentric knowledge-based urban development in practice, asking how to create a Europe that benefits everyone involved. More specifically, it is asking whether the emergence of a new knowledge space has created a multi-urban service node, stimulating innovation and growth across a wider city-region urban field. Drawing on the case of Kennispark (Knowledge Park) in Twente region, the Eastern Netherlands, it analyses the tensions that occur between polycentric and knowledge-based urban development. The paper concludes with the possible implications of such tensions for the science cities in terms of increasing their smart specialisation.

**Keywords:** science city, polycentric urban development, knowledge-based urban development, multi-urban service node

**JEL:** O20, R10, R58.

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## 1. Introduction

The uneven geography of the knowledge economy has long been a concern for policy-makers seeking to ensure that their territories are well-equipped to compete in these new economic times. As early as the mid-1980s, the French national regional development planning delegation (DATAR) published a report arguing that the high-technology centre of Europe was emerging in a particular zone, the European Spine, running from London in the North West, via Amsterdam, south western Germany to the Third Italy of Milan and Turin. Their diagram specifically excluded Paris and its surrounding territories (Île-de-France) from this spatial structure, describing it as falling in a blind spot of European territory (Brunet, 1989). Whilst this was partly as a means of trying to create a consensus in France that a more active engagement was needed with technological development to ensure France's continued future economic success (Benneworth & Dauncey, 2010), it also reflected the increasing spatial differentiation of Europe's high-technology economy. In response to this an alternative model emerged based on West Germany's post-war experience in driving balanced development, seeing territory as a "bunch of grapes", a balanced set of territories with a core serving wider regional hinterland (Kunzmann & Wegener, 1991; Jensen & Richardson, 2003).

Since then, the idea has emerged in Europe of polycentric urban development, taking the logic of the 'bunch of grapes' model and applying it to a Europe no longer of 12, but 28 member-states. In this model, the core of the European backbone has become a reality of a core city network spread across Europe, each supporting and complementing European competitiveness as a whole. Each of the core nodes supports two kinds of territories, both its immediate hinterlands in its functional region as well as a wider sub-European urban network. Within this second order network, outlying nodes represent a second tier of major cities across Europe, still driving the knowledge economy but without the critical mass of the core nodes. Each of these second-tier major cities likewise support both their immediate functional hinterland, but also a wider network of third-tier urban cities within their own nation or city, which each serve their functional hinterland. The competitiveness of the higher-level core nodes supports the lower-level cities by a process of borrowed size, whilst their competitiveness in turn is augmented and

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complemented by unique knowledge specialisations in the lower tier cities (Smith, 2003).

But at the same time, in parallel with that understanding of urban networks has emerged a second approach to understanding urban competitiveness in the knowledge economy, that of knowledge-based urban development (Perry & May, 2008; Yigitcanlar, 2013). Cities are able to improve their competitiveness with urban development projects that become sites for globally-competitive knowledge communities (Benneworth & Ratinho, 2014). By building links to wider global production networks, cities are able to leverage their status as places to be and improve their relative competitiveness. But at the same time, we are struck that the wider geographical consequences of knowledge-based urban development (hereafter KBUD) have not been considered from the perspective of the effect that they have in these wider urban networks. The focus of this chapter is therefore to explore these two parallel facets of the knowledge economy, between urban hierarchies at the scale of Europe as a whole alongside the localised urban effects of particular development projects. This chapter explores this phenomenon from both the perspectives of KBUD and polycentric urban development (hereafter PUD) to understand precisely how these new knowledge spaces contribute to developing urban competitiveness. Taking the example of one new knowledge space, the Kennispark (Knowledge Park), located in Twente, in the east of the Netherlands, the paper reflects on how these new knowledge spaces can contribute to balanced territorial development within multi-level urban hierarchies, and from a policy perspective, contributing to smart, sustainable and socially fair development in the 21st century.

## 2. Literature review

There has been increasing emphasis in recent year amongst both policy makers and academics in using science-based developments as key drivers of economic development in cities and regions (Charles & Wray, 2010; OECD, 2011). Much of this has been rooted in notions of the idea of the individual city competing with others to attract investment and talent from other cities and regions in an increasingly competitive global environment (Kresl and Fry, 2005). A key element of strategic urban science involves the development of particular physical spaces

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that host communities who have privileged positions within particular wider innovation systems. But at the same time, less thought has been given to the other territorial dimension of local KBUD dynamics, the effect that this has on the overall urban structure within the national and continental spaces through which cities also discharge their functions. In this chapter we seek to reflect on the inter-relation between these two dimensions to gain a more rounded understanding of territorial development in the knowledge economy.

## 2.1. Problematics of Innovation conundrum

The emergence of the knowledge economy was first recognised in the 1980s when a number of macro-economist used growth accounting methods to explore the principle drivers of economic growth and productivity (Solow, 1986; Romer, 1994). Their findings highlighted that in the post-war period to 1985, US productivity growth could no longer be accounted for entirely in terms of investments in capital as traditionally understood but there was a considerable residual (Temple et al., 1998). Subsequent research highlighted that this productivity growth was the result of innovations and technological improvements, and could be understood as the accretion of knowledge capital. Knowledge capital, their analyses demonstrated, unlike traditional capitals, did not suffer from congestion when accumulating together (diminishing returns to scale) but rather enjoyed increasing returns to scale. The significance of this evolution lies in the fact that it is now common-place to talk of a new kind of economy, the knowledge economy, where economic processes are fundamentally determined by capacities to invest and reap the benefits from knowledge, alongside more traditional forms of, capital (cf. Knight, 1995).

This had clear territorial implications, that of concentration of knowledge capital investment; the optimal location from this perspective to invest in knowledge capital is always where there are the strongest existing reserves of knowledge capital, because the marginal returns to each investment unit are highest. The characteristic of increasing returns to scale has been tied to the recent emergence of "World Cities", mega-conurbations whose competitiveness is derived from a super-concentration of human capital resources despite the negative congestion effects (Lever, 2002). Likewise, territorial potential is linked to places' capacity to stimulate and exploit investments in knowledge capital to drive productivity

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growth and improvements in welfare (Moulaert & Sekia, 2003). More generally, there has been an increasing interest in how cities create advantages for economic development in the knowledge economy as concentrations of knowledge capital.

Beneath macro-economic growth accounting analyses, much effort has been devoted to understanding how knowledge capital stimulates economic development, and the answer lies in the distinctive process in the knowledge economy being innovation. Innovation involves the combination of new and existing forms of knowledge to create new and better products, processes, technologies and techniques. These innovations represent temporary unique advantages which permit capturing increasing market shares, as well as providing temporary monopolies from which surplus profit in the form of rent can be extracted (Markusen, 1989). It can therefore be argued that competitiveness in the knowledge economy is fundamentally derived from the capacity to acquire, process and combine different kinds of knowledge in ways that meet socio-economic needs in hitherto unanticipated ways. Competitiveness in the knowledge economy can therefore be understood as being ultimately dependent upon capacities to transfer, exchange, circulate and create different kinds of knowledge in ways that meet these needs.

Capacities for knowledge transfer are affected by the characteristics of knowledge; since Nonaka & Takeuchi made a distinction between codified and tacit knowledge (1995), a range of typologies of knowledge and transfer mechanisms have been advanced (Roberts, 2014). These typologies e.g. all reflect the underlying characteristic of knowledge that all knowledge is to some extent situated (Loasby, 1998), and dependent on the circumstances under which it was created. Acquiring knowledge therefore requires an understanding of and accounting for those circumstances, but at the same time most knowledge is not fully codifiable, and is situated or embodied in understandings, practices, and acquaintances (Wenger, 1998). In order to acquire the knowledge, one must engage with those who have those embodied practices and contact networks as well as having access to what knowledge can be codified (Osterloh & Frey, 2000). Knowledge creation and transfer can be understood as a social process that is more or less deeply embedded in particular communities who enact and embody those knowledge forms, and accessing that knowledge requires ensuring participation in those knowledge-producing communities (Gertner et al., 2011). These knowledge

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communities are associated with particular spaces and places, such as a particular laboratory within a single firm, and even as the knowledge spreads and disseminates, these places and their associated communities may remain important to the wider life of the knowledge-creating community.

Knowledge-based urban development can be understood as an attempt to create, encourage and embed the location of particular kinds of situated knowledge communities within urban spaces. At the heart of KBUD lies the notion that the particular places and spaces of knowledge communities have value to the urban fabric and can drive regeneration, gentrification and urban upgrading processes. Investing in these spaces can therefore trigger a wave of other real estate investments seeking to benefit from the spill overs that these sites offer – in terms of infrastructure, labour force, connectivity – creating a positive urban growth effect. There is also a second envisaged benefit from these investments, in that they support and stimulate these communities, and help them to better carry out their knowledge creation activities, both by facilitating local interaction, but also connectivity within wider knowledge producing networks. Benneworth et al. (2011) argued that the success of KBUD projects lay in their ability to balance between these different dynamics, between real-estate-led growth and high-technology innovative-growth (see also Casellas, 2015)

There has, to date, been a tendency to treat these different dimensions rather separately, or to set them up as two distinct categories, the local urban space vs the wider 'global' knowledge networks and innovation systems. Policy-makers seek to promote local urban-science projects, specifically to allow their cities to compete better in wider global production and innovation networks replicating the strong knowledge infrastructure, knowledge resources and diversified economic base that characterises 'winning' knowledge regions and cities (Van Winden, 2009). This reflects to our minds a particular discourse on urban competitiveness which stresses the competition between places for scarce resources, emphasising the importance of developing critical mass. An alternative is to consider the alternative position, of cities whose competitiveness emerges in networks where complementarities and co-operation are also important, drawing on advantages of borrowed size from proximate World Cities and helping support their wider hinterlands and associated smaller cities (cf. Phelps et al., 2001). There has been rather less attention focused on understanding how these new kinds of urban

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knowledge spaces contribute to the shifting typology of these city-networks, to which this chapter now turns.

### **2.2. Polycentric urban development – key to sustainable cities?**

This focus on the competitiveness of particular urban areas seems to be a considerable problem given the increasing realisation of the uneven spatial effects of the knowledge economy. It is not just that the knowledge economy has an uneven territorial geography, but rather than the embeddedness of knowledge means that knowledge is situated in a range of different places. The way that these places inter-relate affects the opportunities that exist for combining that knowledge in new ways to drive innovation forward. This has been explicitly recognised by the emergence of new regional policy approaches which aim to encourage regions to specialise in new niche areas in which they have a clear competitive advantage (Asheim et al., 2010), such as the smart specialisation concept (cf. McCann & Ortega-Argiles, 2013). Notions of smart specialisation and constructed regional advantage are able to capture some of the missing nuance of knowledge embeddedness. But what they are not able to do is capture the specific nature of the relationships between places in urban hierarchies, and the interaction effects between this urban network topology has on urban innovative capacity.

Idea of polycentricity relates to synergy of local assets through cooperation with cities and city regions. Polycentricity makes cities successful in their economic development with the most successful regions becoming 'gateways' to other cities, driving their development, providing transport hubs, nodes in various economic networks (airports, high-speed rail, energy infrastructure, research institutes) nodes in international innovation networks, sites of temporary coalitions and projects. Using strong position in global production networks, they drive innovation-based regional economic development (cohesion) in their wider hinterland. More specifically, little is understood about how urban science projects in whatever form become embedded in polycentric urban structures, and the consequences that this has both for understanding territorial development as well as improving economic development policy for the knowledge economy.

This is particularly important because the natural corollary of competitive knowledge-based urban development is that its general stimulation would exacerbate rather than reduce existing knowledge and economic divides,

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encouraging more concentration of knowledge capital in core regions. But at the same time, there have been a number of regions that have been able to develop more modest science city projects that have improved those cities' positions within the territorial division of labour, but also contributing to development outside their region. Arguably the most visible example of this is the development of the 'Brainport' campus in Eindhoven in the Netherlands, which the Dutch government has supported as a core access point for the whole Netherlands to access the knowledge economy (OECD, 2014). But at the same time other urban locations and districts have emerged which are more explicitly situated within polycentric urban hierarchies (Van Winden et al., 2012; Carvalho, 2013).

The notion of polycentric urban development is part of what Jensen & Richardson (2003) describe as 'monotopic' visions of the functioning of European space, the elimination of barriers, frictions, lacunae and gaps that undermine fair and balanced economic development. Polycentric development seeks to give meaning to the European economy by ensuring that every European region and hinterland is sufficiently connected to Europe's economic fabric to experience more benefits than penalties from being in the EU. This was physically embodied in the 1990s by the Trans-European Networks programme which co-ordinated physical transport investments in Europe around the idea of European corridors, minimising access costs of European regions to European and global markets. A series of policy interventions since the 1990s have also sought to create a monotopic European knowledge space, where all regions are equipped to benefit from European investments in research, technological development and innovation within the Framework Programmes and more recently Horizon 2020, the EU's €70bn, 6-year investment programme for R&D 2014-20 (DG RESEARCH 2014). But a question can be raised about the extent to which visions of knowledge-based urban development, framed around individual cities competing, can be reconciled with ideas of polycentric urban development, with co-operative and complementary relationships between territories. Although urban science projects are promoted as a means of creating opportunities for all places, explicit consideration is not always given to ways in which they can link and strengthen existing urban networks to support balanced and integrated territorial development.

### **2.3. Knowledge-based urban development and domestic dilemmas**

In order to get beyond this tension, we argue that the tensions that exist between the two can be observed clearly in the governance structures which are developed around urban science projects. The notion of 'decentralised centralisation' was first initiated by the Joint State Development Programme for Berlin-Brandenburg and the Joint State Development Plan for the Urban Region of Berlin.

"The principle of decentralised concentration in physical planning policy does not merely imply the creation of a sphere of co-operation, but also an attempt to enrich the traditional repertoire of interventionist influence with strategies for autonomous regional development...resource to source of self-help in the region, a renewed awareness of endogenous potential, an orientation towards creating synergy by networking actors." (Arndt et. al, 2000, p. 1909)

This implies the issue of the importance of the underlying power relations, and in particular between formal versus informal governance structures. Urban science projects tend by their very nature to be concentrated in cities which have their own municipal governance arrangements (notwithstanding that urban governance arrangements are by no means perfect). Conversely, polycentric urban development is an emergent process that is organised across functional territorial networks that may not correspond perfectly with the underlying administrative arrangements. Consequently, PUD governance tends to be primarily informal and negotiated between formal governance actors who seek to use PUD opportunities primarily to benefit their own cities. Nevertheless, a close reading of urban governance literatures does highlight that there is already some understanding of the dynamics urban governance as it might affect knowledge-based urban development and urban science.

Arndt et al. (2000) have reflected on the possibilities that networking offers for metropolitan governance, and in particular for creating networked governance arrangement which balance between different spatial interests within in territories. They in particular point to the role of national-level actors in safeguarding vertical policy co-ordination to ensure that urban actors work together across city boundaries (see also Metaxas and Tsavdaridou, 2013). More generally, there is an emerging literature around initiating networks of different cities towards particular ends (cf. Yigitcanlar and Lönnqvist, 2013, Ergazakis et al., 2006; Metaxas and

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Tsavdaridou, 2013). Part of this is related back to the notions that these networks might provide learning opportunities for regions to improve their own development strategies (Dabinett, 2010; Nijkamp, 1993; Stoker, 1999), representing quite a traditional view of what urban co-operation could potentially bring. But other literature has emphasised the potential for cities to actively mobilise and define territories of interest spanning their respective urban fields in a way to improve their collective management and create new polycentric urban regions (Benneworth & Dauncey, 2010; Deraëve, 2014). A key variable affecting this process is communicating, both in terms of the physical linkages between the cities as well as creating appropriate venues and forums for dialogues to agree common interests, optimise benefits minimise problems and resolve tensions (Arndt et al., 2000; Van Winden et al., 2009).

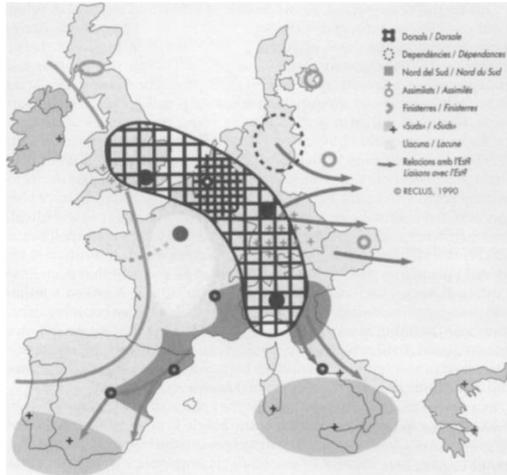
This close reading highlights the fact that there need not be a tension between KBUD and PUD, but there is no guarantee that promoting particular science cities will automatically contribute to balanced urban and regional development. The preceding literature suggests that successful co-ordination of KBUD and PUD in parallel requires implementation of regional and urban development policy with political dialogue cross-cutting both vertical and horizontal levels. It also requires ensuring that particular projects are framed in ways that ensure that stakeholders with a variety of territorial interests are enrolled in coalitions supporting highly localised urban-science developments. And it is clear that the mere existence of potential mutual interest in these projects is not sufficient to ensure that the projects follow a rationale course, rather attention needs be paid to underlying political interactions between places (e.g. Benneworth et al., 2011).

Indeed, this tension has been depicted in competing territorial development strategies that emerged in the early 1990s to describe European territorial development (cf. Jensen & Richardson, 2005). Brunet foresaw the emergence of a highly concentrated knowledge economy based around Europe's continuously urbanized core zone from London to Milan (see *Figure 1*). A competing vision emerged in parallel first illustrated by Kunzmann and Wegener, (1991) as their 'Bunch of grapes' representation of Europe (see *Figure 2*). Exclusively pursuing KBUD strategies without regard for their wider polycentric impacts could therefore drive concentration, whilst the innate capacity of urban science to promote

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polycentric urban development would work towards a more balanced development model.



**Figure 1. The 'Blue' Banana depiction of Europe, Brunet (1989)**



**Figure 2. The 'Green grape' depiction of Europe, Kunzmann and Wegener, (1991)**

In this chapter, we therefore seek to understand the contribution that urban science is making towards European territorial development in terms of reinforcing either centralisation or polycentricity. To do this, we explore how a single exemplar urban science development, the Kennispark (Knowledge Park) campus at the University of Twente, Enschede, the Netherlands, is creating KBUD effects and the extent to which it is driving polycentric urban development. To understand KBUD effects, we explore the extent to which it is creating a new physical space within the city of Enschede that functions as a privileged location for a knowledge community. To do that, we will analyse it using Van Winden et al.'s (2007) model which argues that a knowledge city consists of seven layers, viz. knowledge base, industrial structure, urban diversity, accessibility, social equity and scale. To explore its PUD effects, we explore the extent to which it is improving the connectivity of the Enschede city and Twente region to the wider Dutch knowledge economy. We will do this by discursively analysing how Kennispark (seeks to) position Enschede and Twente better within polycentric urban hierarchies. This comparison provides the basis for us to reflect on the extent to which an emphasis on urban science will act to narrow or to widen growing knowledge disparities in the 21st century European knowledge economy.

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## 3. Introduction to the Kennispark case study

Kennispark is an innovation campus established in the city of Enschede in the Twente region, the Netherlands. Kennispark was created in the 2000s from the merger of two separate but co-located physical sites, the campus of the University of Twente as well as the adjoining Business and Science Park. The University of Twente was created in 1961 as a Technical College to revitalise the dominant industry of the Twente region, textiles, but as textiles continued its further decline, the university reoriented its mission towards stimulating the regional economy more generally. Twente has since the 1960s been a peripheral declining industrial region despite the presence of the university, and Kennispark is the latest of a series of efforts to address this by strengthening the technology and innovation capabilities of individual companies. The main objective of Kennispark is to create 10,000 high-technology jobs by 2020, fusing the university and science park into an innovative urban knowledge district.

From 1984, the university has run a highly successful spin-off company scheme, the Temporary Entrepreneurs Programme (TOP, following its Dutch abbreviation). The Business and Science Park was created in 1989 as a joint venture between the university, the local municipality, the university of applied science and the regional development agency, and was located immediately to the south of the UT campus. The origins of the BSP lay in a Business Technology Centre, BTC, which was created in 1982 to provide appropriate accommodation for new high-technology firms, funded by the regional development agency, regional bank and the Control Data Corporation, who had pioneered the concept in Minneapolis St Paul.

The idea for Kennispark emerged in discussions between the university and the municipality regarding the extension to the lease for the BSP, with the idea of Kennispark first being floated in 1999 as the next stage in site development. The subsequent step came in 2001 when the university came up with a concrete proposal to replan the campus and BSP into a single site as part of a fundamental reconstruction of the campus. The content for the Kennispark idea was inspired by a development within the campus space, the MESA+ nanotechnology laboratory, formed in 1999 from a merger of research centres in molecular electronics and materials science. The formation of the new research centre saw the development of a new strategy including an additional task for the centre, that of research

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valorisation. This saw the introduction of mixed-use space on the MESA+ laboratory, with existing firms using laboratory space, students undertaking placements in those firms, and from the early 2000s onwards, an increasing number of new spin-off companies.

MESA+ became a physical anchor point for a knowledge community in the emerging field of nanotechnology and a significant player in the Dutch nanotechnology research landscape (Benneworth & Hospers, 2007). A number of these spin-offs had moved into premises on the BSP as they started to grow, expanding the physical footprint of the knowledge community into the BSP. The idea into which Kennispark evolved was to expand this knowledge community from the field of nanotechnology to high-technology more generally across the UT's research fields, and to create a new knowledge district for Enschede. From 2006, municipality and university worked together to lobby the Province and Ministry of Economic Affairs for funding to realise this vision, including removing the road flyover that physically separated the two locations.

The viaduct removal was the first step that physically permitted the opening of the campus southwards towards the Business and Science Park by facilitating its transport connectivity. The site's further evolution included the redevelopment of the former large Chemical Technology building (Langezijds) as a location for high-technology businesses as well as for shared equipment use, notably in the medical technology area (Pinheiro & Benneworth, 2014). The first phase was completed in late 2013 and formally opened by King Willem-Alexander in April 2013. The campus restructuring also saw the MESA+ laboratories relocated to be adjacent to the Gallery, and the former MESA+ cleanroom site (approximately 1 km away) developed into a pilot manufacturing site for nanotechnology business (the 'High-technology factory'.)

### 4. Kennispark as an example of KBUD

To explore how Kennispark functions in terms of stimulating KBUD in Twente, we draw upon Van Winden et al.'s 2007 model of the factors constituting knowledge cities, namely knowledge base, industrial structure, urban diversity, accessibility, social equity and scale. In terms of the knowledge base, Kennispark does bring together a range of different knowledge communities in different technological

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sectors but also in different kinds of organisations, including students, university researchers, innovation staff, entrepreneurs, and supportive foundations. The public research base is provided by two public research institutions, the University of Twente as well as the University of Applied Science, Saxion, which has a number of Associate Professors responsible for organising 'knowledge circles' to exchange knowledge with innovative regional business. There are a relatively large number of comparatively small innovative businesses located in and around Kennispark that contribute to this overall knowledge base. Although Twente's investment in R&D is comparatively low, at 1.7% of GDP (2010) when one looks at the claimed per capita tax relief for business investment in R&D&I then the province of Overijssel in which Twente is located ranks third of the twelve provinces on per capita terms (albeit below the national level as the figures are dominated by Philips in Noord Brabant).

The second issue relates to the industrial structure, which in the case of Twente was of a traditional old industrial region strongly oriented towards the textiles industry, with secondary specialisation in the machines and mechanical engineering industry (initially deriving from textiles machinery). In the 1980s and 1990s, some unemployment was absorbed by the attraction of substantial amounts of foreign direct investment (FDI), attracting large assembly factories including Polaroid as well as distribution and logistics centres because of its proximity to the Amsterdam-Berlin motorway. The activities associated with Kennispark have been involved in some renewal of these sectors – there is some interaction of the main remaining textiles company (Ten Cate) and the university around its high technology materials, investing in Thermoplastic Composites Research Centre (together with Boeing and a range of regional development agencies). The main sectors that have emerged around Kennispark have been related either to existing strengths of the region, for example in the regional hospitals (medical technologies) or around research strengths of the university (industrial design, nanotechnology). Those university research activities were based on choices made in the university's initial decades when thought was being given to which disciplinary coverages the university should have to support regional industry without excessively overlapping with the Netherlands' two other technical universities.

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The third factor is the success of the region in transferring knowledge between companies in the region, as well as with the regional knowledge institutes. There has been very strong public support in Overijssel into innovation and knowledge transfer activities, something greatly helped by the fact the Province received a massive financial windfall in 2009 from the sale of an electricity company in which it held shares. Kennispark became a focal point for the province's investment in innovation, because Kennispark had from the mid-2000s clearly caught the national government's attention, and given the national government's decision to invest only in successful places, became a means to attract more public funding for innovation activities. This has resulted as already noted in a relatively high participation by regional businesses in investments in innovation; the university of Twente also was rated in 2013 as the most entrepreneurial university in the Netherlands by ScienceWorks and Elsevier, both in terms of its provision of entrepreneurial activities but also because of the extent of the funds from business the university was able to acquire. A task more impressive given that there is no immediately proximate large innovative business such as Philips, or a university hospital; much of those resources come to fund interactions based around the Kennispark site.

The fourth factor named by Van Winden et al. relates to the quality of life in the region. When the university was originally created, it was located in a strongly working-class industrial town with no tradition of higher education in any form. This meant that the campus planners specifically included staff housing on the campus to ensure that new professors used to Delft would not feel too unhappy with their new surroundings. Likewise, they built student accommodation on the campus to minimise anticipated town-gown frictions. With the arrival and settling of the new highly educated population, this contributed to a gradual shift in the nature of housing in the region, with the creation of a much higher demand for more mixed accommodation. With a steady expansion of staff and student numbers, the campus was quickly unable to accommodate the full university community, leading to their expansion into the city; the student fraternal associations also acquired housing for their members, and the presence of large numbers of students (albeit largely associated with Saxion) this has given the city of Enschede the feel and vitality of a student city in terms of social and cultural opportunities relative to its overall size. The student associations themselves are housed in a monumental villa on the main town square, which first served as a

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textiles warehouse and then as the office complex for Polaroid, and their activities have a strong presence in the city.

This issue of the impact of large number of students, and the student associations, also relates to the fifth Van Winden variable, urban diversity and cultural mix. The Twente region had a large immigrant population, with roughly 16% of the population 1st or 2nd generation immigrants (Databank Twente, 2013), evenly split by western and non-western background. The region has a substantial number of residents of both Turkish and Syrian origin including from the Syrian Orthodox Community, the centre of the Archbishopric of the Netherlands being located in the Glane village near to Twente. Alongside this Twente and Saxion have had a significant impact on this through the attraction of foreign staff, Ph.Ds and students. A particular factor in this regard is the University ITC-faculty, which has its origins in a Ministry of Foreign Affairs funded research centre the International Institute for Geo-Information Science and Earth Observation, which merged into the university in 2010. The ITC provides high-level training and education for developing world cartographers and geographers to improve their domestic cadastral and survey systems; research from I&O Onderzoek noted that there are 142 nationalities and 212 ethnicities resident in Enschede, a fact definitely attributable to the presence of the university. Although the ITC education and residential facilities are currently located in Enschede city centre, at the time of writing, planning is underway to relocate activities to the Kennispark site.

The final Van Winden et al. factor is that of scale; from the perspective of Twente, there is a key issue that the region is heavily split along a number of fault lines; there is a split between more conservative rural municipalities and a more socially democratic set of urban municipalities, a similar but parallel split in the importance of religion as a socio-political force (with the Dutch 'bible belt' running through the west of the region) and a split between the urban municipalities which are of greatly differing sizes. Although several attempts have been made to merge municipalities and create a "Twente City", whenever these discussions have emerged (the last time being Spring 2014), smaller cities fear a loss of identity and domination by Enschede. The contribution of Kennispark to this process is its contribution to the start of a process by which the Twente municipalities start to articulate a common sense of scale, and plan city-regional activities across Twente as a whole. In 2005, the Twente Innovation Platform was launched, leading to the

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launch of a common innovation strategy, whose administration was moved back in 2011 to the Kennispark organisation. At the same time, the regional inter-municipality organisation has launched a number of spatial strategies in which Kennispark is articulated as a plan of regional significance – the university research centre for the region (alongside other knowledge community districts, such as the High Technology Materials campus in neighbouring Hengelo). Therefore, Kennispark also contributes to the building of urban scale in a heavily fragmented urban region.

### 5. Twente as an example of PUD

This final factor of building urban scale illustrates the possible positive ways in which the Kennispark site contributed to polycentric urban development, in that case at the more local/ regional scale. Kennispark became integrated into part of a wider process where the 14 Twente municipalities sought deliberately to manage their space strategically at the regional level. The Provincial Regional Innovation Strategy Plus (RIS+) developed in 2001 had had almost no effect in having a regional co-ordination effect because projects were planned and delivered at a local level. However, from the early 2000s, partly in response to provincial pressure, the municipalities began working together more strategically through the Regio (the inter-municipal organisation) to develop a common economic development strategy. This hints at a growing realisation amongst municipalities in this period that there was a need for each municipality to avoid attempting to develop their own autonomous local economic development strategies, and to instead build regional complementarities. This took the very simple form of the Regio developing a list of priority regional projects, thereby providing a very simple means to prevent overlap and to provide a degree of spatial balance and connectivity. It is hard to demonstrate whether the net effect on policy-makers was to persuade them that the Kennispark was a regional asset (as its founders claimed) or whether this list simply managed to persuade them that they were receiving their fair share of the regional investments. Nevertheless, Kennispark was articulated at a time when the Twente municipality were attempting to shift their economic development strategies from one of individual urban competition to a greater degree of co-operation and mutual interdependence.

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One of the arguments that can be made to underpin this claim that Kennispark was being seen as an asset with wider economic development consequences beyond the immediate boundaries of its host municipality emerges from this issue of Provincial pressure. The Province was already in 2006 aware of the fact that attracting investment from a national level (which it could in turn use to co-finance European regional development funding) was dependent on municipalities presenting Kennispark as a strong regional asset. From 1980 there had been a switch in regional policy to compensating for failure to supporting growth potential, initially funding all regions investing in activities such as science parks and innovation centres. But in 2004, a radical change in direction was marked with the publication of Peaks in the Delta, which highlighted six regions of whose success was critical to the overall success of the Netherlands, including the main port regions of Amsterdam and Rotterdam, as well the so-called Brainport region around Philips in Eindhoven and the Hydrocarbons in the north. The role of the east of the Netherlands envisaged in this strategy was stated as a place where knowledge was translated into high-technology business (Economische Zaken, 2004, authors' own translation).

The reason for this status can be traced to Kennispark; the Ministry was aware of the unique performance of UT in creating spin-off companies and was keen to expand that model more generally to the east and in the Netherlands as a whole. The idea of Kennispark had emerged in 2001 and had been written into a series of regional development strategies presented to the Ministry, as a result of which it was included in the Peaks strategy. Although there was no large scale consolidated investment programme lying behind this strategy, the Ministry did provide on an annual basis a series of funds to projects which supported this overall vision (crucially not all of which were located in Enschede but were also located in for example Hengelo and Oldenzaal). This provided a steady stream of funding for a range of Kennispark projects, alongside municipality, Provincial and European projects, and helped contribute to building a sense of success of the Kennispark project as a whole, and the sense that it was delivering for the region as a whole. In 2007, the Minister of Economic Affairs visited the region to receive the Innovation Route report, and urged participants to focus more on areas of particular success and not to invest in many small projects. This led to a focusing on a few strategic projects, including Kennispark, and in 2010, the Regio formally

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adopted the notion of the Innovation Triangle, three strategic projects to drive the region forward, including Kennispark.

The investments made into Kennispark and its success in persuading national policy-makers of its value was also important when Dutch innovation policy underwent a radical shift in 2010 in response to the formation of a right-wing government, which immediately said that innovation policy would immediately be closely aligned behind the wishes of ten top sectors, the ten most innovative and competitive Dutch industries. Moreover, Infrastructure, Research and Economic Development investments were also to be realigned to support these Top Sectors. This was part of a political rhetoric at the time of the Netherlands being a small country, and it therefore had to make strategic policy choices for excellence. The complete absence of spatiality from this perspective led to a real risk that the strategy would default to supporting 'mainports, brainport and greenport', the industrial, agricultural and horticultural agglomerations around Amsterdam, Rotterdam, Eindhoven and Venlo (in north Limburg). The East of the Netherlands would therefore have been completely invisible in this new policy map had it not been for the mobilisation of a fourth category of sites of special economic and innovation interest. These were the urban regions which are important for Top Sectors but which do not form part of the mainports, brainport or greenport, namely Groningen, Arnhem-Nijmegen, Brabantstad, Twente and Maastricht-South Limburg. Thus, Kennispark has been part of a process which has underpinned a long-standing Dutch tradition of balanced (i.e. polycentric) urban development across the Netherlands (which has persisted to this day, see OECD, 2014), but which was clearly threatened by the latest policy emphasis on directing massive multi-annual investment programmes towards the major urban cores.

### **6. Knowledge-based urban development to strengthen polycentric urban development?**

This chapter has sought to explore the apparent conundrum or tension which underpins recent attempts by policy-makers to use urban science approaches to drive balanced territorial development. We have highlighted two main trends in the literature, one rooted in urban competition, seeing these urban science projects as driving knowledge-based urban development, whilst another set of literatures

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rooted in spatial planning, regarding urban science as about managing nodes within wider polycentric urban networks. Our concern has been that because of the prevalence of the 'Matthew effect', with success breeding success, urban science would actually undermine balanced territorial development, and certainly within the European context, work against the goals of the Europe 2020 strategy of building smart, successful and inclusive regions. The Kennispark example has provided a means to understand how one urban science project operates in a polycentric context and to reflect on lessons more generally for understanding how urban science projects function.

The most obvious of our stylised facts is that it is possible for urban science to positively support polycentricity; the example of Kennispark is an example of how localised knowledge spaces following Van Winden et al. s (2007) typology can also support polycentric urban development (see section 4). From this, it is possible to answer our main research question, regarding whether there are strong tensions between creating competitive local knowledge spaces and more balanced territorial development, and clearly, part of the perceived success of Kennispark (demonstrated for example by its inclusion in a range of national strategies) was that its value was deliberately constructed and articulated at a political level relationally rather than linked to the highly localised space. In particular, emphasis was laid on how although it was a very territorially focused scheme, redeveloping a 700ha land parcel, this created wider benefits for regional partners as a whole, in particular by creating an asset visible at the national scale (which in turn brought benefits to those regional partners). At the same time, however, there are still tensions, highlighted by the OECD (2014) that national policy-makers may nevertheless overfocus their infrastructure investments on the main perceived centres of competitiveness (Amsterdam, Rotterdam and Eindhoven) and neglect internal linkages between these centres and second tier urban centres, such as Enschede.

But these are principally political effects, that is to say that the knowledge-based urban development was sufficiently attractive to policy-makers at a range of scales (from the local to the national and even EU) to materially influence policy and expenditure decisions. It might therefore be the case that local policy-makers are able to support an urban science project because they see it brings additional subsidies to the region as a whole. But that is a very different rationale to arguing

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that those policy-makers realise that the urban science project can have regional benefits as a whole and in turn to manage their own local territorial policy to ensure that they are able to maximize their knowledge economy benefits as spokes around a regional node. Likewise, it is not fair to argue that because national policy-makers recognise a regional node as being in some way successful they will necessarily alter their own spatial investment priorities to work towards a more polycentric approach to territorial development. Certainly, in the Netherlands, which has a long and enduring tradition of inter-regional equity, then it is perhaps not surprising that policy-makers would recognise the strengths that Kennispark brought to the wider Dutch knowledge economy. But it would take a great deal of sensitivity to transfer these findings to countries with much deeper-ingrained knowledge inequalities, such as the UK (cf. Charles & Wray, 2010) and this of course implies that although H2020 might promote scientific excellence, without considering these urbanisation effects there are potentially lost opportunity costs in these territorially-neutral science-investment projects that may work against territorial cohesion.

We argue that more nuance is required in understanding how urban science projects – particularly in second-order, ordinary regions and territories – contribute to polycentric urban development in the context of the knowledge economy. Given the tendency of the European policy domain to converge around simple economic development ideas (highlighted for example by the specific development of concepts to try and prevent this happening, such as smart specialisation), clearly effort is needed to understand how urban science operates and can be managed in these polycentric networked urban hierarchies. Just as there is an emphasis on regions to develop unique specialisations, positive sum outcomes from urban science require exploiting existing inter-urban connections to improve status within wider production and political networks. But at the same time, what seems a relatively simple diagnosis is clearly riven with all kinds of tensions and problematics that require further disentangling. This should form the focus for future research and policy analysis efforts to maximise the contribution that urban science spaces can make to balanced territorial development.

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## 7. References

- Arndt, M., Gawron, T. and Jahnke, P. (2000). 'Regional policy through co-operation: from urban forum to urban network', *Urban Studies*, 37(11), 1903-1923.
- Benneworth, P.S. and Dauncey, H.D. (2010). "International urban festivals as a catalyst for governance capacity building: The legacy of Lyon's failed Olympic 1968 bid" *Environment & Planning C* Vol. 28, 1083-1100, doi:10.1068/c09136.
- Benneworth, P. and Hospers, GJ. (2007). Urban competitiveness in the knowledge economy: Universities as new planning animateurs, *Progress in planning* 67 (2), 105-197.
- Benneworth, P. and Ratinho, T. (2014). Regional innovation culture in the social knowledge economy. *The Social Dynamics of Innovation networks*, 240-255.
- Asheim, B. T., Boschma, R., & Cooke, P. (2011). Constructing regional advantage: platform policies based on related variety and differentiated knowledge bases. *Regional Studies*, 45(7), 893-904. Brunet R. (1989) *Les villes europeennes*, DATAR, Paris.
- Casellas, A. M. (2015). *Technopoles of the world revisited*, London: Routledge (forthcoming).
- Charles, D.R. and Wray, F. (2010). Science cities in the UK, paper presented at Melbourne 2010 Knowledge Cities World Summit, Melbourne, 16<sup>th</sup>-19<sup>th</sup> November.
- Dabinett, G. (2010). Spatial justice and the translation of European strategic planning ideas in the urban sub-region of South Yorkshire, *Urban Studies* 47:11, 2389-2408.
- Databank Twente (2013) Monitor-demographie: demografie-migratie. Enschede: Regio Twente. Available online at: <http://www.databanktwente.nl/demografie-migratie.html> (Last Accessed: 20th December 2014).
- Deraëve (2014) Pôles métropolitains: the French approach towards inter-city networking, *Regional Studies*, *Regional Science* 1:1, 43-50.

## Managing science cities spaces in wider urban hierarchies

Reconciling knowledge-based and polycentric modes of urban development

---

- DG RESEARCH. (2014). "What is Horizon 2020", Brussels: DG RESEARCH, Available online at <http://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020> (Accessed 20th December 2014).
- Ergazakis, K., Metaxiotis, K., Psarras, J. and Askounis, D. (2006). A unified methodological approach for development of knowledge cities, *Journal of Knowledge Management*, 10:5, 65-78.
- Economische Zaken (2004) "Pieken in de delta", The Hague, Ministry of Economic Affairs (MINEZ)
- Gertner, D., Joanne Roberts, David Charles, (2011), "University-industry collaboration: a CoPs approach to KTPs", *Journal of Knowledge Management*, Vol. 15 Iss: 4 pp. 625 – 647
- Jensen. O.B. & Richardson, T. (2003). Being on the map: the new iconographies of power over European space. *International planning studies*, 8:1. 9-34, doi:10.1080/13563470320000059246.
- Kunzmann, K.R. and Wegener, M. (1991). The Pattern of urbanization in Western Europe, *Ekistics*, 58: 350/351, 282-291.
- Knight, R. V. (1995). Knowledge-based development: policy and planning implications for cities. *Urban Studies*, 32:2, 225-260.
- Kresl, P. K. (2005). *Planning Cities for the Future: Urban Economic Strategies in Europe* (Edward Elgar: Cheltenham).
- Lever, W. F. (2002). Correlating the knowledge-base of cities with economic growth. *Urban studies*, 39(5-6), 859-870.
- Loasby, B. J. (1998). The organisation of capabilities, *Journal of Economic Behavior & Organization*, Elsevier, vol. 35(2), pages 139-160, April.
- Markusen, J.R. (1989) Trade in Producers Services and in Other Specialized Intermediate Inputs, *American Economic Review*, vol. 79, 85-95.
- McCann, P. and Ortega-Argilés, R. (2013). Modern regional innovation policy, *Cambridge Journal of Regions, Economy and Society* 6.2 (2013): 187-216.

## Managing science cities spaces in wider urban hierarchies

Reconciling knowledge-based and polycentric modes of urban development

---

- Metaxas, T. and Tsavdaridou, M. (2013). 'From 'Blue Banana' to 'Red Octopus' and the development of eastern and southern European cities: Warsaw and Lisbon, *Regional and Sectoral Economic Studies*, 13:1.
- Moulaert, F. and Sekia, F., (2003). Territorial Innovation Models: a critical survey, *Regional Studies*, 37:3, 289-302.
- Nijkamp, P. (1993) Towards a network of regions: the United States of Europe, *European Planning Studies*, 1:2, 149-168.
- Nonaka, I. and Takeuchi, H. (1995) *The knowledge creating company: how Japanese companies create the dynamics of innovation*, Oxford University Press, Inc.
- OECD (2011) *Regions and Innovation Policy*, OECD Reviews of Regional Innovation, OECD Publishing, doi: 10.1787/9789264097803-en (Accessed 20<sup>th</sup> June 1014).
- OECD (2014) *OECD territorial reviews Netherlands 2014*, OECD Publishing. <http://dx.doi.org/10.1787/9789264209527-en>. (Accessed 20<sup>th</sup> June 1014).
- Osterloh, M. and Frey, B.S. (2000). Motivation, Knowledge Transfer, and Organizational Firms, *Organizational Science*, 11, 535-550.
- Phelps, N. A., Fallon, R. J., and Williams, C. L. (2001) Small Firms, Borrowed Size and the Urban-Rural Shift. *Regional Studies*, 35(7), 613-624
- Perry, B. and May, T. (2010) Urban knowledge exchange: devilish dichotomies and active intermediation. *International Journal of Knowledge-based Development*, 1, 6-24.
- Pinheiro, R. and Benneworth, P. (2014). *A critical assessment of tensions and contradictions*, Routledge.
- Roberts, J. (2014) "Community and the Dynamics of Spatially Distributed Knowledge Production: The Case of Wikipedia" in Rutten, R. Benneworth, P. Irawati, D & Boekema, F. (eds) *The social dynamics of innovation networks*, London: Routledge.
- Romer (1994) The origins of endogenous growth, *Journal of Economic Perspectives*, 8:1, 3-22.

## Managing science cities spaces in wider urban hierarchies

Reconciling knowledge-based and polycentric modes of urban development

---

- Solow, R. (1986) Unemployment: getting the questions right, *Economica*, 53, 89-119.
- Stoker, G. (1999) *The New Management of British local Governance*, London, UK, Macmillan.
- Smith, R.G. (2003) World city typologies, *Progress in Human Geography*, 27:5, 561-582.
- Temple, J. and Johnson, P.A. (1998) Social capability and economic growth, *The Quarterly Journal of Economics* 113(3), 965-990.
- Van Winden, W., Van den Berg, L. and Pol, P. (2007). European cities in the knowledge economy: towards a typology, *Urban Studies*, 44:3, 525-549.
- Van Winden, W (2009) Outlook on Europe: Knowledge and the European City, *Economische en Sociale Geografie*, 101:1, 100-106.
- Wenger, E. (1998) *Communities of practice: learning, meaning and identity*. Cambridge University Press. ISBN 052143017.
- Yigitcanlar, T. (2008) *Knowledge-Based Urban Development: Planning and Applications on the Information Era*. Information Science Reference Publishing (IGI Global), Hershey, Penn.
- Yigitcanlar, T. and Lönnqvist, A. (2013) Benchmarking Knowledge-Based Urban Development performance: Results from the international comparison Helsinki, *Cities*, 31, 357-369.