Smart city making and regimes of urban development

[The influence of various contexts of urban environments on municipal strategies for smart city development]

by

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Abstract

An increasing number of cities in the Netherlands decide to adopt the smart city model of urban governance. It is evident that some of those cities progress faster than others with regard to the quality and the comprehensiveness of their smart city strategies. This paper seeks to identify which dimensions of the local economic, political, and academic environments influence the level of smart city development and the substantive focus of local smart city strategies. It does so by building and testing a set of six hypotheses based on the aspects of the 'smart city' and 'urban regime' theories. The analysis shows that the elements of the local academic environment may prove more important for the process of smart city making than the constituents of the local economic and political environments. Specifically, the strength of the local tertiary education sector seems to have a statistically significant impact on the level of smart city development. Also, the political 'color' of the ruling local majority seem to not matter when we talk about smart city modeling. Policy makers and other interested parties are advised based on the results of this paper to focus their efforts on cities that hold strong tertiary education bases, but also start to actively promote 'knowledge' and 'know-how' sharing between municipalities in order to make smart city development progress uniformly across the country.

Keywords: smart city, urban development, urban regimes, collaborative arrangements, 'triple-helix', Netherlands.

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1. Introduction

Currently, an increasing number of municipalities worldwide chose to adopt the *smart city* model of urban development. This model requires fundamental changes to the operational mechanisms of urban socio-economic and political infrastructures, thus it naturally asks for significant amounts of efforts and resources that have to be delivered by all involved stakeholders. Nonetheless, at this point, it is evident that some of the municipalities are more successful in transitioning towards *smart city* models of governance than others. The problem that motived the initiation of this research relates to the aspects of urban socio-economic and political dimensions that can assist in the process of *smart city* making. While a vast number of research projects were designed to study the aspects of a *smart city*, little attention was given to the significance of the local economic, political and academic parameters on the processes of *smart city* development.

The *smart city* concept is relatively new but widely used among academia, public officials and experts in order to describe urban development models based on principles of sustainability, civic participation, and efficiency. Conceptual boundaries representing *smart city* are somehow fuzzy and dynamic which in turn leads to confusions about what does it exactly stand for. However, scholars are slowly progressing towards agreeing on the attributes that each *smart city* should possess. Thus, a *smart city* can be considered to be a well-defined urban area in which all levels of public administration promote and implement policies focusing on inclusion, participation, and sustainable growth by employing ICT solutions and technological innovations (Waart et. al. 2016; Alverti et. al., 2016; Christopoulou et. al, 2014; Mulder, 2014; Deserti & Rizzo, 2014). Moreover, academia has had identified a series of dimensions and characteristics by which *smart city* can be grouped, analyzed and ranked. Nam & Pardo (2011), for example, mention three distinct *smart city* dimensions which are concerned with technology, human and institutional aspects. Giffinger et. al. (2007) and Giffinger & Gudrun (2010), on the other hand, developed a more detailed version of *smart city* categorization which is based on six specific axes: (1) smart governance; (2) smart economy; (3) smart people; (4) smart mobility; (5) smart environment and (6) smart living. This last framework will be slightly adjusted and used to build both dependent variables related to this research. Thus, *the level of smart city development*, which will be deducted by taking into consideration the number of *smart city* projects, *smart city* themes affected by those and the *smart city* experience measured in years of active strategies; and *the substantive focus of local smart city strategies,* which indicates the direction towards which the *smart city* strategies are leaning, will be characterized based on the previously mentioned six dimensions of *smart city* development. Subsequently, due to the fact that selected municipalities greatly differ in the essence and complexity of their *smart city* strategies, we will use aspects of the *regime theory* developed by Stone (1989, 1993), Stoker & Mossberger (1994, 2005) and Etzkowitz & Leydesdorff (2000) to explain such differences.

Smart city making, as a complex process, can be considered a result of certain collaborative arrangements between governmental and societal actors, usually labeled as *regimes*. *Urban regime theory* is often used to analyze and describe such public-private collaborations. The theory aims at explaining the aspects of interdependence between governmental and non-governmental actors in solving socio-economic conflicts and achieving a state of socio-economic growth (Stoker & Mossberger, 1994). Moreover, the theory defines urban regimes as informal but stable collaborative arrangements between governmental and social actors and identifies three distinct types: organic, institutional and symbolic *regimes*. The aspects of symbolic *regimes* are considered to be closer to the processes of *smart city* making due to the fact that such *regimes* see urban change and economic growth as fundamentally based on 'environmentalism, historic preservation, increased socio-economic opportunities for the disadvantaged class and aspects of city branding' (Stone, 1993). Another taxonomy used to analyze *urban regimes* was developed by Etzkowitz and Leydesdorff (2000). It sees *urban regimes* shaped by the attributes and actions of the predominant party within the local collaborative arrangements and names three types of regimes: (a) '*laissez-faire*', (b) '*statist*' and (c) '*triple helix'* regimes. A '*laissez-faire' regime* can be characterized by limited state intervention in the market dynamics and a high degree of freedom for the industry and business. In this setting local economic environment is considered to be the main driving force in establishing trends of urban development while the government and the academia will have supporting roles. Within a '*statist' regime* the government has the leading role in setting the trends and conditions of urban development. Industry and academia will play supporting roles and will work towards the goals established by the government with little or no possibility for initiating and developing their own innovative transformations (Etzkowitz & Ranga, 2015). And lastly, the '*triple helix' regime* can be characterized by its balanced approach towards urban development where universities and other knowledge institutions receive an equal status to the government and the industry, and at some points even taking the lead in developing and implementing solutions for socio-economic conflicts (Etzkowitz & Ranga, 2015). The typology developed by Etzkowitz and Leydesdorff (2000) will be used instead of the framework elaborated by Stoker & Mossberger (1994) due to the fact that the first one is somehow more detailed in describing the aspects of different *urban regimes*.

Research area and topic

The research topic of this project can be described as the 'impact that aspects of local economic, political and academic environments have on the processes of *smart city* making'. The core problem definition that results is described as 'the lack of concise empirical evidence on the influence that aspects of local economic, political and academic environments have on the *smart city* modeling'. The area of this research relates to the 'Selected Dutch *smart cities*', specifically 39 smart municipalities in the Netherlands.

Research framework

A research framework represents a schematic delineation of the actions necessary to achieve the research objective (Verschuren et. al, 2010, p.65). However, before elaborating on how this research will attain its objective, it is important to introduce the main research question. Thus, the research question that will perform the steering function for this thesis refers to:

To which extent do the local economic, political and academic environments influence the level of smart city development and the substantive focus of the smart city strategies of selected smart municipalities in the Netherlands?

In the context of this research, the relationship between the local economic, political and academic environments on the level of *smart city* development and the substantive focus of local *smart city* strategies is considered. Taking into consideration the explorative goal and the quantitative approach of this project the desk research strategy may prove a good choice in exploring the relationship of this phenomena in the previously stated context. By using a secondary research approach, a set of publicly available urban datasets will be analyzed and interpreted from the perspective of this paper. Thus, in order to answer the main research question, a literature review on the *smart city concept* and *urban regime theory* will be performed. This, in turn, will provide conceptual background based on which a set of six hypotheses will be elaborated and highlighted in the '**Theoretical framework'** chapter 2. Chapter 3 '**Research design'** presents the research methodology behind answering the research question. It provides information about variable operationalization and selected method of analysis. Chapter 4 **'Results'** provides the statistical information necessary for understating the relationships between the dependent and independent variables based on which we will reject or confirm research specific hypotheses. Lastly, the '**Conclusion and Discussion'** chapter (5) provides a series of interpretations of the research findings and concludes those by providing an answer to the research question and directions for further research.

2. Theoretical Framework

This chapter represents the theoretical framework of this master thesis. It presents and discusses the main theoretical concepts and possible relationships between the *smart city development, the substantive focus of smart city strategies* and the parameters of the *local economic, political and academic environments* seen through the lenses of the *regime theory*. The chapter begins with the introduction of the *smart city* concept and its related characteristics. It then continues with an overview of the *urban regime theory* as a paradigm of urban development. The rest of the chapter is organized as follows: section 2.3 presents *urban regime theory from the 'lassiez-faire' perspective*; section 2.4 shows the elements of the '*statist' model of urban regimes*; section 2.5 mentions the aspects of the *"triple helix' model* and lastly, section 2.6. *Conceptualization* highlights the *conceptualization model* and provides *a summary of developed hypotheses* specific to this research.

2.1 Smart Cities

The *smart city* concept aroused as a popular topic for discussions among public officials, academia and private entities relatively recently. However, Shelton et. al. (2015) evokes that the concept of *the smart city* is not really new. He states that urban planners and engineers have been using 'qualitative and computational methods' to manage cities since 1950's. Similarly, Lee et.al. (2013) argue that the *smart city* concept can be considered an evolutionary outcome of the information city, which was essentially a 'new type of urban economy built around technologies and their applications'. Continuing the same line of thought, Hollands (2008) brings to our attention the fact that during the 1997' 'World Forum on Smart Cities', attendees agreed that a rise of 50.000 smart cities and towns around the world can be expected within the next decade (1997-2007). Of course, their estimation was little too optimistic, however, the omnipresence of the *smart city* concept within political and civic discourses can be easily observed. The exact number of smart cities currently operating on a world scale is difficult to establish due to the fact that different actors use different definitions designed to identify, characterize and rank smart cities. Nonetheless, irrespective of the precise definition there is little doubt that the number of smart cities is constantly growing. According to a report developed by the Navigant Research (2016), there were about 235 smart cities around the world in 2016. Another source, IHS Markit (2015), give a smaller number, mentioning 21 smart cities in 2013 with the expectation for a rise to 88 by 2025. Scholars are slowly progressing towards agreeing on attributes that each *smart city* should possess. For example, Waart, Mulder & Bont (2016) see *the smart city* as a well-defined geographical area in which the wellbeing for citizens is achieved via inclusion, participation and sustainable development policies, all in close cooperation with ICT solutions. Other scholars define smart cities as a 'cultural change' where the citizens and the cultural heritage are the main engines for the *smart city* making (Alverti et. al., 2016). In general, the *smart city* can be defined as a well-defined urban area in which all levels of public administration are embracing and promoting smart policies and programs that aim for sustainable urban development, economic growth and the overall improvement of the quality of life by investing in human capital, technological innovations and encouraging citizen-driven initiatives (Waart et. al. 2016; Alverti et. al., 2016; Christopoulou et. al, 2014; Mulder, 2014; Deserti & Rizzo, 2014).

Smart city components and characteristics

The smart city making, as a complex ongoing process, is aiming to integrate various components of an urban structure. Researchers who support the integrated aspect of a smart city argue that within complicated urban environments none of the systems can operate in isolation (Albino, Berardi & Dangelico, 2015). In order to better comprehend the terminology and the delimitations of the smart city concept, an analysis of the core dimensions and related concepts should be performed. Based on the research executed by Nam & Pardo (2011), the conceptual cousins of the smart city can be categorized into three dimensions: (a) the technology dimension; (b) the human dimension and (c) institutional or community dimension.

Table 1. Dimensions and conceptual relatives of Smart Cities

Dimensions	Related Concepts	Specific characteristics
Technological dimension	*Digital city*	combines service oriented infrastructure and innovation
	Intelligent city	emphasizes the importance of technological innovations
	Virtual city	represents the virtual reality which need to be in synergy with the physical reality
	Ubiquitous city (U-city)	creates an environment of enhanced connectivity
	Information city	open data though IT infrastructures; real time data collection
Human dimension	*Creative city*	Social and intellectual capital are indispensable for smart city making.
	Humane city	creates multiple opportunities to expand the personal, intellectual and professional potential of its inhabitants.
	Learning city	It aims to improve the competiveness of its inhabitants in the context of global knowledge economy.
	Knowledge city	promotes innovation via its educational institutions and networks.
Institutional dimension	*Smart community*	agreement and collaboration between the elements of urban governance are essential in the smart city making
	Smart growth	

Source: adapted from Nam & Pardo (2011)

The aforementioned three components are helpful in understanding, at least partially, the attributes of a smart city, however, those components are considered rather too general. Thus, as a way to further advance the framework designed for analyzing smart cities, Giffinger et. al. (2007) and Giffinger & Gudrun (2010) developed a set of six characteristics 'axes' that build a smart city. Their framework proved to be helpful and popular with a number of international institutions, including the European Union, which use it as a tool to rank, analyze and develop smart cities worldwide. Those characteristics are:

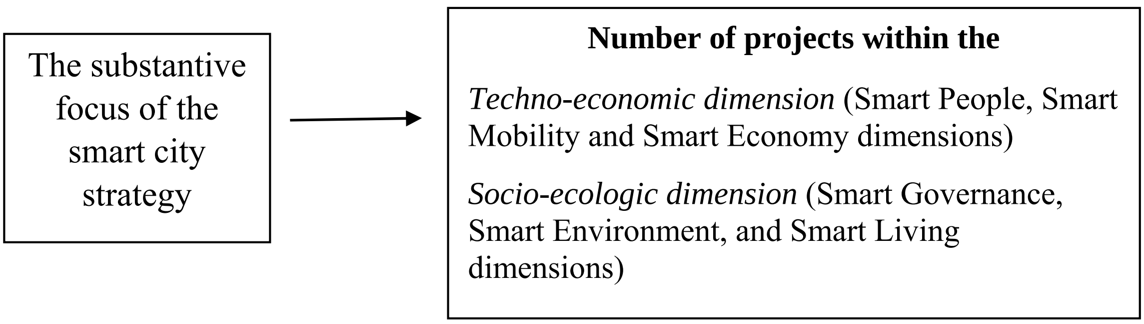
1. *Smart Governance* – a city uses ICT solutions for management practices and activities carried out with the aim to improve the quality of public services and communication.
2. *Smart Economy* – a city is enabling and promoting an innovative environment for businesses (local, national, international) and civil society, in order to enhance productivity, efficiency, and effectiveness and be able to compete both locally and globally.
3. *Smart Mobility* - a city pursues to offer the most efficient, clean and equitable transport network for people, goods, and data.
4. *Smart Environment* – a city designs and implements smart policies in order to achieve a more efficient and sustainable urban environment while improving the citizens' quality of life.
5. *Smart People* - a city creates efficient conditions and policies for training and personal development for its citizens, with the aim to improve civic innovative spirit, creativity, innovation and ultimately enhance collaboration and social cohesion.
6. *Smart Living* - a city is proactively managing public spaces, facilities, and resources in order to create a wealthy, safe and culturally rich urban environment.

Fig. 1. Smart City dimensions

Source: Author's elaboration based on Giffinger et. al. (2007) smart city framework

For the purposes of this research project, the aforementioned axes will be used to develop both dependent variables. Therefore, for '*the level of smart city development'* variable which relates to the number of smart city projects and the degree to which selected municipalities are active within all smart city domains will be taken into consideration; while for *'the substantive focus of the local smart city strategy'* variable we will group smart city axes into two distinct categories (techno-economic and socio-ecological), aggregate related projects for each of the categories and determine the direction towards which local smart city strategies are leaning. More information about the procedures performed in order to operationalize research specific dependent variables is presented in chapter 3.

Fig. 2. The formation of the 'substantive focus of the smart city strategy' variable



One last step in the quest of understanding the smart city concept is to present the meaning of the word '*smart'* in the context of smart city paradigm. For this reason, the word '*smart'* will be defined from the marketing, urban planning, and technological perspectives, as suggested by Nam & Pardo (2011). Thus, from the marketing perspective, the word '*smar*t' is centered on a user dimension. It is considered somehow superior to the term *intelligen*t and displays a user-friendly attitude. As a result, we can suggest that a smart city should be responsive to users' (citizens) feedback and adjust itself to their needs and preferences. From the urban planning perspective, the word '*smart'* is treated as a normative claim and ideological dimension directed towards strategic growth and sustainable development. In the context of the smart city model of urban governance, all levels of public administration are expected to embrace and promote smart policies, programs, and strategies. And lastly, from the technological perspective, '*smartness'* indicates the intelligent-acting products and services. Such technological products and services are capable of self-configuration, self-adjustment, and self-optimization. When incorporated within a smart city model, smart technologies are playing a central role in urban governance creating a smart ecosystem characterized by an environment which is well-connected via platforms, sensors, and devices.

2.2 Urban regime theory

The conceptual fundaments of the *regime theory* were developed by Clearance N. Stone (1989) through a study of the local political dynamics in Atlanta, the U.S., for a period of four decades in the post-war time of the 20^{th} century. Some of the postulates presented by Stone relate to the idea that elected public officials are often constrained by the economic factors in their pursuance of achieving a state of socio-economic wellbeing for the communities they represent. At the same time, actors representing business communities require support from governmental officials in realizing their interests. Thus, the crucial entity which can link both parties throughout informal collaborative relationships and help them achieve pre-established individual goals is considered to be an *urban regime.* Stone (1989, p.7) also mentions that the most valuable and influential *regime* partners can be considered those which bring considerable resources to the negotiation table. Such partners can range from public and business figures to actors representing labor unions, non-profit organizations, and even church. While Clearance Stone initiated *regime theory* by analyzing local arrangements in urban settings in the United States, Stoker & Mossberger (1994, 2005) examined the possibility of exporting those theoretical aspects to the European context.

Regime theory can be considered a dominant paradigm in the field of urban affairs for the last decade or so. Originally developed to describe the aspects of the collective action in the U.S., it soon became a popular tool for the academic community to analyze regional, city, sub-city and even neighborhood levels within a wider range of western countries (Stoker & Mossberger, 1994; Mossberger & Stoker, 2001). The focus of the *urban regime theory* is mostly directed towards the problems of collective organization and action. It aims at explaining the aspects of interdependence between governmental and non-governmental actors in solving socio-economic conflicts and achieving a state of socio-economic growth (Stoker & Mossberger, 1994). The necessity of developing an urban theory describing configurations of local collaborative arrangements was vastly motivated by a shift in the domain of urban affairs in which local authorities became increasingly dependent on other social actors in their quest of solving urgent problems and attaining strategic socio-economic goals. This aspect is confirmed by Stoker and Mossberger (1994) which state that the effectiveness of local governments depends greatly on their ability to organize cooperative agreements with non-governmental actors. Precisely, governmental agents aim to invite, organize and utilize limited resources that are often concentrated in the non-public sectors. Stone (1989, p.4) defined *urban regimes* as informal, yet stable collaborative arrangements between local governments and societal actors in which institutional and private resources are organized and enabled in order to diminish socio-economic conflicts and achieve a state of socio-economic growth. Such regimes often operate without any forms of formalized command and control procedures, making the collaborative interactions similar to informal networks. At this point it is important to mention that a stable urban regime should not be seen as a granted element of an urban political and economic infrastructure, on contrary, regimes have to be achieved via active collaborative and cooperative activities, thus not all cities will possess such regimes. For cities that have urban regimes, the forms of those regimes will vary based on the goals that have to be achieved. Stoker and Mossberger (1994), for example, highlight three types of urban regimes that differ based on the catalysts for cooperation, types of cooperative agreements and the purposes followed by those agreements. Specifically, *organic regimes* seek to maintain present characteristics of their communities, having few aspirations for growth or change. *Instrumental regimes*, on the other hand, focus on short-term development guided by goals shaped within the specific project like strategies. Lastly, the *symbolic regimes* aim to change local communities in fundamental ways. The main purpose of *symbolic regimes* is considered to be the transition towards new models of growth and urban development centered on distinct values and conditions under which such transitions can take place. Also, *symbolic regimes* stress the importance of environmentalism, historic preservation, increased socio-economic opportunities for the disadvantaged class and aspects of city branding (Stone, 1993). In this last type of urban regime, the elements of the smart city transitioning can be noticed. Distinctively, smart city model requires a fundamental change in the values of socio-economic governance, is greatly concerned with environmental issues, actively promotes certain conditions and ideas (sustainability, equality, entrepreneurship, etc.) under which urban development can take place and purposefully uses aspects of city branding in order to attract investments and skilled residents. While this classification can help understand specific aspects and conditions under which local smart city movements are initiated and implemented, it is rather too general and thus proves limited in explaining differences in the level of smart city development between municipalities.

Another typology that can be used to analyze urban regimes was developed by Etzkowitz and Leydesdorff (2000). Its original purpose was to explain certain characteristics and dynamics of collaboration within *'triple helix'* models of urban governance, but it can be also used to describe urban regimes from the perspectives of the actors involved in such agreements. Thus, the typology presents three distinct models: (1) *'laissez-faire' model* which focuses on industry and business actors; (2) *'statist' model* which emphasizes the importance of governmental actors and the (3) *'triple helix' model* which highlights the significance of the academia within local collaborative agreements. For the objectives of this research, the models suggested by Etzkowitz and Leydesdorff (2000) by will be discussed in more detail in the following sections and used as theoretical backbones for further hypothesis development.

2.3 'Laissez-faire' regime of urban development

A 'laissez-faire' regime can be characterized by limited state intervention in the market dynamics and a high degree of freedom for the industry and business. The aspects of this type of regime are very much alike to the U.S. models described by Clearance N. Stone, which can be considered essentially 'laissez-faire' models with key leading roles for the economic actors. Thus, the local economic environment is considered to be the main driving force in setting trends of urban development while the other two actors will play some supporting roles. In those roles, the government will act primarily as a 'relaxed' regulator of socio-economic mechanisms, while the academia will act as a provider of skilled human capital specifically trained to meet the requirements of the market (Etzkowitz & Ranga, 2015). The privileged position of the industry and business is also highlighted by Stoker and Mossberger (1994) which mention that governments are placed in a position to seek out for business support and approval due to the fact that the later holds important economic potential that is crucial for maintaining and amplifying social wealth and ultimately the degree of local political legitimacy. Translating the aforementioned arguments to the matter of smart city transitioning we can suggest that the local economic environment, specifically the number of locally operating companies and the number of jobs that those create, will greatly impact the direction and the speed at which such transitions take place. Furthermore, it can be also suggested that some of the economic sectors will be more influential than the others. For example, industrial, energetic and ICT sectors will be more concerned with urban transitions than agriculture, mineral or health sectors. This aspect can be explained by the fact that the rate and the quality of growth for companies operating within the first mentioned sectors may be directly interrelated with the decisions of local governors to adopt or not a smart city strategy. Moreover, those sectors are known to have significant amounts of resources open for being used for lobbying activities, some of which may be directed towards local authorities, influencing them in adopting smart city models and therefore opening great opportunities for those companies. Thus, in order to create a better understanding of the influence that interested economic sectors might have on the speed and direction of local smart city strategies we decided to limit our focus only on those sectors which were grouped under the '*techno-economic'* dimension. Hence, assuming the series of last arguments the following hypothesis can be elaborated:

Hypothesis 1: The stronger the techno-economic sector of the local economy is the higher the level of smart city development.

Fig. 3. Considered economic sectors

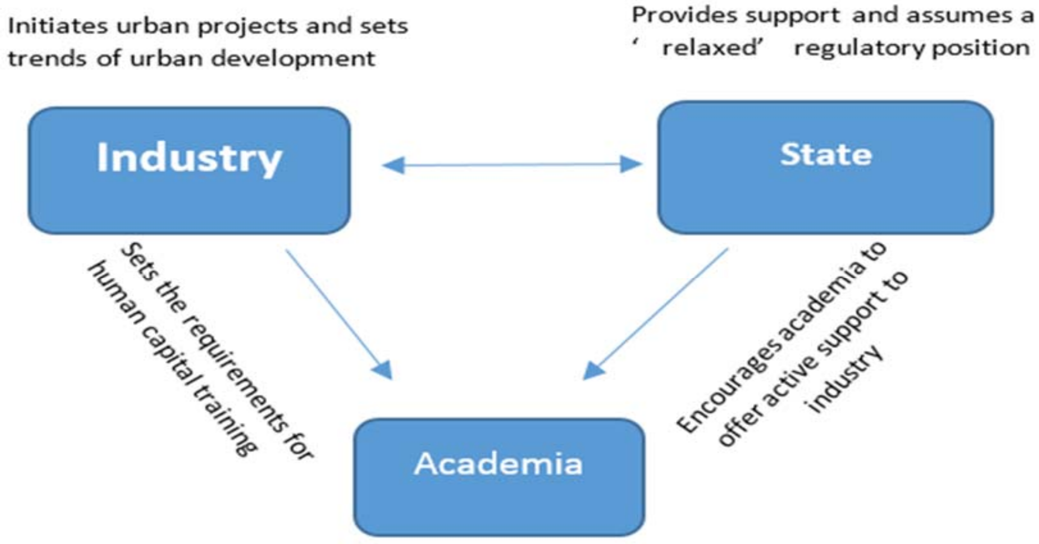
1. Industry
2. Energy
3. Construction
4. Trade
5. Transportation and Storage
6. Information and Communication

→ Techno-economic sector

In today's market economy business entities are urged to build sound pragmatic strategies that will lead to stable growth and continuous innovation. At times such strategies require additional external resources which can be achieved via specific expansive, merging or networking activities. Bafarasat (2018) argues that the majority of such tactics are shaped and applied at the city-region level where most of the competition between business clusters takes place. Thus, assuming the high potential that the smart city market provides in terms of opportunities and growth, local businesses (especially those operating within the techno-economic sector) will be highly motivated to penetrate that market and realize their business strategies. As a result, the number of smart city projects in the techno-economic dimension shall be higher where the base of local companies operating in that field is higher. This idea is expressed in the next hypothesis:

Hypothesis 2: The stronger the techno-economic sector of the local economy is the higher the percentage of smart city projects in the techno-economic dimension.

Fig. 4. The 'laissez-faire' regime of urban development



Source: Author's elaboration based on Etzkowitz and Leydesdorff (2000) classification.

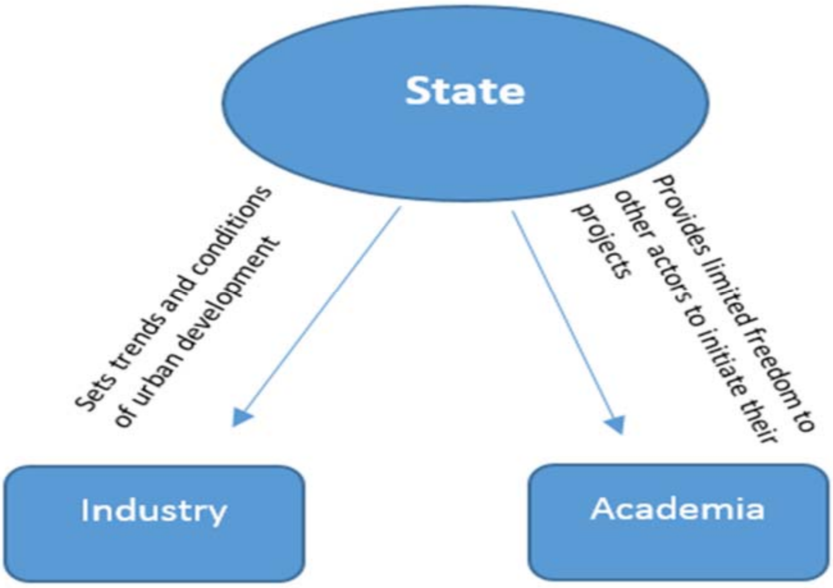
2.4 'Statist' regime of urban development

Within a 'statist' regime the government has the leading role in setting the trends and conditions of urban development. This type of regime can be attributed to a European phenomenon characterized by stronger roles for the state in urban affairs and public decision-making as compared to the typical U.S. models. In this case, the industry and the academia will play supporting roles and will work towards the goals established by the government with little or no possibility for initiating or developing their own innovative transformations (Etzkowitz & Ranga, 2015). While the stringent version of this regime is less omnipresent within the western developed states, some of its aspects can be still observed when looking at communities in which political actors hold central roles in the decision-making processes. Nonetheless, coalition building lies at the core of the regime approach, so even in a statist regime, the governments are still placed in positions to form coalitions with partners from inside and outside political scene (Stoker & Mossberger, 1994). The attributes of such coalitions may differ based on the ideological orientation (*left-right)* of the ruling political class. Thus, taking into consideration the legislative and executive powers that local councils have in countries such as the Netherlands (Instituut voor Publiek en Politiek, 2008), it can be suggested that the ideological orientation of the majority of councilors will influence the substantive focus of the smart city making but not its degree. The argument behind this statement is that the local authorities of any political 'color' will aim to obtain a high level of urban growth and development but will have different ideas on how to achieve it. Subsequently, it can be suggested that if the local majority of councilors it attached to the leftist political ideology than the focus will predominantly be on the socio-ecologic dimension of smart city development, which in turn will logically denote less efforts directed towards the techno-economic demission. Based on these arguments we can build our next set of hypotheses:

Hypothesis 3: The strength of leftist parties within municipal councils does not affect the level of smart city development.

Hypothesis 4: The stronger the leftist parties are within municipal councils the lower the percentage of smart city projects in the techno-economic dimension.

Fig. 5. The 'statist' regime of urban development



Source: Author's elaboration based on Etzkowitz and Leydesdorff (2000) classification.

2.5 The ‘Triple Helix’ regime of urban development

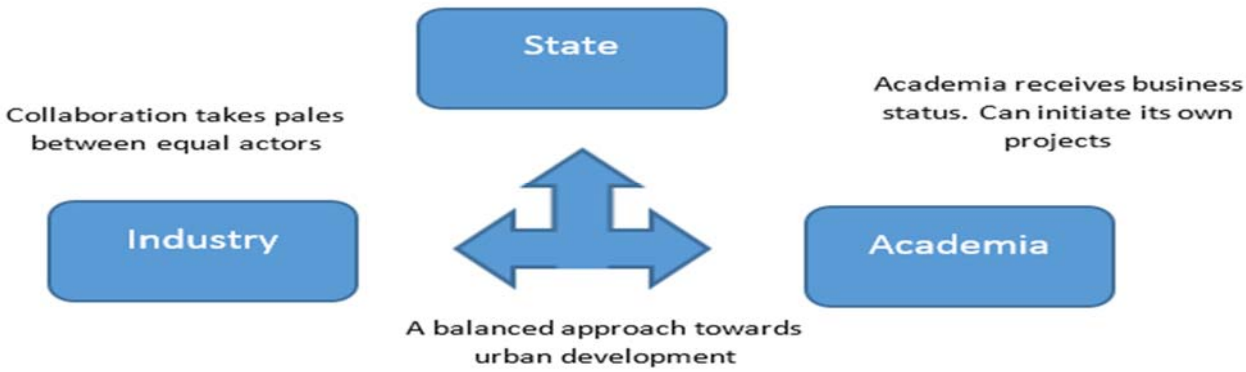
The ‘Triple Helix' regime can be characterized by its balanced approach towards urban development where universities and other knowledge institutions receive an equal status to the government and the industry; and at some points even taking the lead in developing and implementing solutions for socio-economic conflicts (Etzkowitz & Ranga, 2015). Besides the fact that universities may be possessors and producers of vast amounts of know-how, labor and even technological resources, their inclusion within the previously dominated public-private partnerships may follow a specific functional role. For example, Etzkowitz & Ranga (2015) and Benneworth et.al. (2015) argue that any pairing of the industry, government or academia will inevitably lead to some kind of deadlocks at a certain point, therefore by adding a third party and transitioning towards triadic types of relationships the participants will be able to turn tension and conflict of interests into convergence and confluence of interests. Departing from these arguments we can suggest that local academic environment can be expected to influence the degree of smart city making. However, it can also be suggested that tertiary educational institutions (WO and HBO universities) will have a higher impact on the process of smart city making as compared to other types of academic organizations. At this point we can build our next hypothesis and state:

Hypothesis 5: The stronger the local tertiary education sector is the higher the level of smart city development.

In order to further understand how universities can shape the directions of urban development within knowledge societies, it is important to bring forward specific shifts that took place along their recent operational and functional evolution. Based on the Etzkowitz & Ranga's (2015) opinion the most notable shift can be considered the recent addition of the ‘third mission' to universities which indicates the active involvement of the later within local/regional socio-economic development. The second shift denotes the university's ability to continuously provide student graduates with progressive ideas, skills and entrepreneurial talents which in turn may have a direct impact on the ulterior modeling of the local business and innovation trends. And lastly, universities increased their internal organizational capabilities of technology generation and transfer and thus achieved formal statuses of business/commercial actors. By bringing together all of the aforementioned points it can be suggested that the predominant scientific direction of the tertiary educational institutions operating within the municipal boundaries will influence the direction and characteristics of the smart city making. As a result, we can build our 6th and last hypothesis:

Hypothesis 6: The more technologically focused the local tertiary education sector is the higher the percentage of smart city projects in the techno-economic dimension.

Fig. 6. The ‘triple-helix’ regime of urban development



Source: Author’s elaboration based on Etzkowitz and Leydesdorff (2000) classification.

2.6 Conceptualization

This section provides an overview of the research question, related hypotheses and conceptual boundaries of this research.

Research question:

*To which extent do **the local economic, political and academic environments** influence **the level of smart city development and the substantive focus of the smart city strategies** of selected smart municipalities in the Netherlands?*

Thesis specific hypotheses:

H1: The stronger the techno-economic sector of the local economy is the higher the level of smart city development.

H2: The stronger the techno-economic sector of the local economy is the higher the percentage of smart city projects in the techno-economic dimension.

H3: The strength of leftist parties within municipal councils does not affect the level of smart city development.

H4: The stronger the leftist parties are within municipal councils the lower the percentage of smart city projects in the techno-economic dimension.

H5: The stronger the local tertiary education sector is the higher the level of smart city development.

H6: The more technologically focused the local tertiary education sector is the higher the percentage of smart city projects in the techno-economic dimension.

Table 2. Independent and dependent variables

Independent variables	***Dependent variables***
The strength of the local techno-economic sector	The level of smart city development
The strength of leftist parties in local councils	
The strength of local tertiary education sector	The substantive focus of the smart city strategy
The scientific focus of local tertiary education sector	

At this point it is important to highlight that we only focus on specific aspects of the local economic, political and academic environments which are presented in the conceptual table below:

Table 3. Conceptual boundaries

Concepts	Dimensions	Elements
Local economic environment	Techno-economic sector	(1) Industry; (2) Energy; (3) Construction; (4) Trade; (5) Transportation and Storage and (6) Information and Communication economic sectors
Local political environment	Left-wing parties	National and local left-wing parties that had seats within municipal councils within 2006, 2010 and 2014 municipal election cycles
Local academic environment	Tertiary education sector	Local HBO and WO universities
	The scientific focus of tertiary education sector	The predominant number of faculties in the technologic or non-technologic dimension
The level of smart city development	The degree of smart city development as result of summing distinct elements	Number of smart city projects, themes and years of smart city experience
The substantive focus of the smart city strategy	Percentage of smart city projects and initiatives in the techno-economic dimension	Smart Technology, Smart Mobility and Smart Economy and Energy

3. Research design

This chapter unfolds the research strategy and the methodology behind current research. The first section *3.1 Case selection* section describes the logic behind choosing specific cases and their representativeness. The section *3.2 Operationalization* describes the independent and dependent variables, their related indicators and measurements. *3.3 Method of analysis* section presents the arguments behind choosing *Multiple regression analysis* as the main statistical tool for this thesis. The last section *3.4 Limitations* delivers insights into the limitations of this research.

3.1 Case selection

At the beginning of 2017, a large number of Dutch municipalities, companies, and scientists in collaboration with the central government have adopted the *National Smart City Strategy Netherlands.* At that time point, a total number of 37 (G5 + G32) municipalities were part of this national strategy, all different in the number and features of the local smart city projects and initiatives that they promote (SmartCityHub, 2017). The author decided to use the '*Smart City Embassy*' web platform as the main database for grouping those projects with respect to their essence and location. The reasons behind this choice are in principle pragmatic and relate to the aspects of availability, reliability, and simplicity of the necessary data as well as the tools destined to manage it available on the website. It important to mention that the '*Smart City Embassy*' was created by Amsterdam Smart City, Connekt and the Ministry of Infrastructure and Water. The aim of this interactive web platform is to provide information about the smart city initiatives, projects, products and services in the Netherlands (SmartCityEmbassy, 2018). For the purposes of this research project, all municipalities that are currently listed within the 'Smart City Embassy' platform with at least one smart city project or initiative active were selected for analysis. Also, it is important to mention at this point that cities without any smart city status or active projects are considered to be unrepresentative for this research. Therefore, in the technical sense this sample can be viewed as truncated implying some biases in the case selection procedures, however, the sample contains some forms of variation presenting municipalities with modest levels of smart city activity. Any attempt to introduces cities located outside the 'Smart City Embassy' will lead to some occurrences of missing data for aspects of selected dependent variables. In the end, a selective sample of 39 municipalities representing about 10% of Dutch municipalities, predominantly but not exclusively large, were identified:

Table 4. Smart cities in the Netherlands in 2018

1	Aalsmeer	11	Etten-Leur	21	Leeuwarden	31	Tilburg
2	Almere	12	Gouda	22	Maastricht	32	Utrecht
3	Alphen aan de Rijn	13	Gravenhage (Den Haag)	23	Nederweert	33	Venlo
4	Amersfoort	14	Groningen	24	Nieuwegein	34	Vianen
5	Amsterdam	15	Haarlem	25	Nijmegen	35	Vught
6	Apeldoorn	16	Haarlemmermeer	26	Purmerend	36	Wageningen
7	Breda	17	Helmond	27	Rotterdam	37	De Wolden
8	Delft	18	Hengelo	28	Soest	38	Zaanstad
9	Eindhoven	19	Hertogenbosch	29	Staphorst	39	Zaltbommel
10	Enschede	20	Kampen	30	Texel		

Source: http://www.smartcityembassy.nl

3.2 Operationalization

The process of operationalization allows the transition from complex and abstract theoretical concepts into observable and measurable indicators. For the purposes of this research project, the independent variables are considered to be multidimensional and relate to the *local economic, political and academic environments,* while the dependent variables relate to the *level of smart city development and the substantive focus of the local smart city strategies.* Thus, any changes in the configuration of local economic, political and academic environments are expected to influence (or not) the aspects of the local smart city development and smart city strategy. The process of the operationalization of all variables is presented below.

3.2.1 Independent variables

Local economic environment

This variable is employed with the purpose to analyze the state of the local economic environment for all selected smart cities. For the objectives of this research local business community is composed of two specific indicators: (1) number of companies operating within municipal boundaries and (2) number of jobs within those cities. In order to filter the input data so it meets the pre-established conceptual (smart city) boundaries only six economic sectors listed within CBS Statline database are considered: (1) Industry; (2) Energy; (3) Construction; (4) Trade; (5) Transportation and Storage and (6) Information and Communication[1]. It can be argued that those sectors are expected to be closer to the smart city principles and thus have a higher impact on the processes of smart city making. Data for all cases was gathered from CBS StatLine, which is the electronic databank of Statistics in the Netherlands, via a cross-sectional approach at the 2010-time point. The author is aware that this decision may lead to some issues of validity taking into consideration the fact that majority of smart cities in the Netherlands were proclaimed as such years later. However, the argument behind this choice relates to the fact that the actual transition towards a smart city requires time and resources. Thus, resources (business and labor) are seen as a starting point for this transition. Moreover, it can be reasonably expected that local business communities in the Netherlands will not change significantly over short-medium periods of time or if such changes will occur the element of similarity across cities can be expected. Later, for each city, the number of jobs within selected economic sectors was summed in order to form a unique number which was further divided to the total number of jobs per city so the relative weight of the selected sectors can be determined. The absolute number of companies in each selected sector was retrieved, summed to form a unique number per city and transformed into a logarithmic version of this variable in order to control for the large differences between selected cities. Lastly, due to the fact that both variables use different measurement units, it is important to standardize them by using z-scores. This process allows us to sum both variables and create a single number which represents the level of strength of the techno-economic sector in the local economy.

Local political environment

This independent variable aims at analyzing local political dynamics within selected smart municipalities. Given the fact that municipal councils have the representative, controlling and policy-making responsibilities in the Netherlands, they can be naturally considered central to the initiation and implementation of the local smart city strategies. For these reasons, municipal councils, or political constellations within local councils, are used in order to determine local political climates. Such constellations are analyzed based on the mainstream *left-right* political categorization, with a focus on the strength of leftist parties within municipal councils. In order to determine which national parties are left or not, the author used the political categorization

[1] The following economic sectors were left out from the analysis: (a) Agriculture, forestry and fishing; (b) Minerals extraction; (c) Water companies and waste management; (d) Horeca (food service industry); (d) Financial services; (e) Rental and trade of real estate; (f) Specialist business services; (g) Rental and other business services; (h) Public administration and government services; (i) Education; (j) Health and welfare; (k) Culture, sports and recreation; (l) Other services.

provided by the NSD (Norwegian Centre for Research Data) which presents periodic left-right scores ranging from -100 (left) to + 100 (right) for ten (5 left and 5 right-wing) major national political parties in the Netherlands. The classification is based on information provided in the Comparative Manifesto Project, from party descriptions in Europa World Yearbook, Encyclopedia Britannica and in election reports from the European Journal of Political Research and/or Electoral Studies (NSD, 2018). Deriving from the NSD taxonomy the (1) *PvdA Social Democratic, (2) SP Communist, (3) D66 Social Democratic, (4) GL Ecologist and (5) PvdD Special Issue/Ecologist* parties were identified as being left-wing[2]. In addition to the NSD classification, we were struggling with the fact that local political parties were difficult to classify as left or non-left. For that reason, the author decided to conduct an individual analysis for the local parties with seats in municipal councils guided by specific keywords mentioned in table **5**. For all local parties either on the basis of 2018 political platforms or based on the related historical political developments as presented in press publications, platforms or articles we were able to a certain extent identify local left-wing parties. In consequence, local political parties that presented a clear indication of their belonging to the leftist ideology combined with those parties that have the largest part of their political programs built around the keywords of leftist ideology were considered left, while local parties that have a clear indication of their association with the right-wing ideology combined with those parties with hybrid, progressive or unknown political manifesto were considered non-left. As a result, 26 cities were found to have at least one local leftist party (see Appendix **7**). Data for this variable was gathered from the 'verkiezingsuitslagen database' managed by the 'Kiesraad' (Dutch electoral council) by following a time series approach organized around local electoral cycles. Due to the fact that smart city-making is a complex process the author analyzes 2006, 2010 and 2014 electoral cycles. This aspect may help uncover local political dynamics and trajectories during the transition, development, and implementation of smart city strategies within selected cities. Data gathering processes focus on the number of council seats held by lefties parties and the percentage of those seats from the total number of council seats. In order to form the final coefficient that will represent this variable the average percentage of left-wing seats in municipal councils from three electoral cycles will be calculated.

Table 5. Keywords for political ideologies

Political direction	**Keywords**
Right	private enterprise, free market, fiscal responsibility, democracy, international cooperation, economic liberalism.
Left	shared responsibility, stewardship, justice, solidarity, employment, social welfare, education, public safety, healthcare, environment, pacifism, conservation of nature and the environment.

Source: Norwegian Centre for Research Data

[2] NSD scores for selected left-wing parties: PvdA Social Democratic = -7; SP Communist = -17.9; D66 Social Democratic = -6,6; GL Ecologist = -6,9 and PvdD Special Issue/Ecologist = -5.

Local academic environment

As an independent variable, the local academic environment is employed in order to understand the aspects of academic potential within all selected Dutch municipalities and is built around the following pillars: (1) academic presence; (2) academic strength and (3) academic focus. The (1) academic presence relates to the presence of universities within municipal boundaries. For the purposes of this research, only research universities (WO or wetenschappelijk onderwijs) and universities of applied sciences (HBO or hoger beroepsonderwijs) are considered due to the fact that such institutions are believed to have a higher impact on the local smart city making. Next step relates to attaching a weight coefficient for both types of universities. Thus, WO universities received "1" weight coefficient while HBO universities received "0,5" weight coefficient. The argument behind this choice relates to the fact the WO universities are expected to have a higher impact on the process of smart city development compared to the HBO institutions due to the differences in the amounts of resources available for both. The list of HBO and WO institutions was retrieved from 'studielink.nl' web platform, which is a national enrolment system for degree-seeking university students in the Netherlands. Once the information about universities was obtained and specific coefficients attached, summing procedures of both coefficients formed the measurement for the (1) academic presence. Local (2) academic strength (number of faculties) and local (3) academic focus [3] (scientific direction) were derived from the analysis of the number and scientific orientation of all faculties (HBO faculties + WO faculties) active within municipal boundaries. The information related to these aspects was obtained by examining official websites of selected universities. In general, the data about faculties or schools and their scientific focus was readily available for the majority of universities, with the exception of the *Saxion University of Applied Sciences* (Enschede, Deventer, and Apeldoorn) which did not present clear information about which of its 12 faculties operate within three municipalities. Thus, a phone call to the *Saxion* service desk was performed that successfully clarified all the details. Due to large differences in the number of faculties per selected cities, it was decided to categorize the variable representing (2) academic strength. As a result, four categories were created each containing a specific number range and respective values attached for each case: 0 = 0; 1-15= 1; 16-30 = 2 and 31-45 faculties = 3. Obtained values were later summed with the (1) academic presence coefficient in order to create a unique measurement number for the local academic environment. Parallel with the procedures mentioned above the faculties for each university were grouped into 'tech and non-tech' categories, where 'tech' faculties are considered those that have the words "technology, IT, ITC, engineering, computer science, natural sciences, industrial design" (or any other combination between them) in their domain name, while 'non-tech' where considered the rest. By performing the last action, the (3) academic focus of universities was established, transformed into relative percentages of 'tech' and 'non-tech' faculties per city and used as the last independent variable.

[3] While the (3) academic focus is a part of this multidimensional variable its dimensions were used as a separate independent variable in order to test the Hypothesis number 6.

Table 6. Operationalization of the independent variables

Variable	Elements	Description	Source	Measurement
Local economic environment	Number of jobs for six economic sectors	The relative number of jobs per six economic sectors based on the total number of jobs per city	http://opendata.cbs.nl/statline/ Banen van werknemers in December; economische activiteit (SBI2008), regio/2010	Summed z-scores for both variables Min = -3,20 Max = 2,20 Mean = ,000 SD = 1,11
	Number of companies for six economic sectors	The absolute number of companies per six economic sectors transformed into a logarithmic variable	http://opendata.cbs.nl/statline/ Vestigingen van bedrijven; bedrijfstak, gemeente/2010	
Local political environment	Number of left-wing parties' seats within municipal councils	The relative number of left-wing seats from the total number of seats within municipal councils for the 2006, 2010 and 2014 electoral cycles	http://verkiezingsuitslagen.nl/ Gemeenteraad/ 2006/2010/2014	The average percentage of left-wing seats per city per three selected cycles Min = 11,76 Max = 77,78 Mean = 51,29 SD = 15,83
Local academic environment	University presence coefficient (x)	Number of HBO and WO universities present within municipal boundaries and the specific coefficients attached to them	http://info.studielink.nl/ Overzicht Hogescholen http://info.studielink.nl/ Overzicht Universiteiten	Coefficient resulted from the summing procedures of *x and y* Min = 0 Max = 8,5 Mean = 1,91 SD = 2,11
	Academic strength coefficient (y)	Summed number of HBO and WO faculties operating within municipal boundaries and ulterior categorization within four specific ranges		
	Academic focus (used as a separate independent variable)	Number of faculties per city grouped based on the *tech* and *non-tech* classification	Universities' official websites	The percentage of *tech* and *non-tech* faculties per city Min = 0 Max = 75,0 Mean = 8,79 SD = 15,25

3.2.2 *Dependent variables*

At the basis of this research project lie two dependent variables: (1) the level of local smart city development and (2) the substantive focus of the local smart city strategies. Both variables present different aspects of smart city strategies for selected municipalities. A detailed explanation regarding the operationalization process will be presented below.

The level of smart city development

In order to operationalize this dependent variable a set of factors were considered. First of all, the information related to the number and essence of the local smart city projects was retrieved from the 'Smart City Embassy' database. It is important to mention that within this database the projects are being grouped based on the location and smart city categories (themes) that those cover. The categories used are similar to the smart city axes developed by Giffinger et. al. (2007), thus the author decided to use the later as the primary smart city project classification tool for this research. Once all of the smart city projects listed in the database were identified, assigned per municipality and the smart city themes that those cover checked, (1) the total number of projects and (2) themes affected per municipality were established. Another dimension of this variable relates to the number of years of smart city experience that each of the selected cases has. In order to find the values for this sub-variable the internet search engines were used with the 'smart city (city name)' and 'slimme stad (city name)' keywords and majority of the relevant web pages scanned for (a) formal announcements of the smart city transitions, (b) the announcement of the first smart city project or (c) the first time point when the combination of the 'smart/slimme and city name' was used by recognized news agencies, web platforms, etc. As a result, the smart city experience was calculated by subtracting the 'first time point of smart city mentioning' from 2017 (which is set as the time reference for thesis). In order to control for large differences in the values representing the (1) total number of projects and (3) years of smart city experience, it was decided to categorize[4] both variables into specific groups, where (1) total number of projects is categorized as (a) 1-5 = 1; (b) 6-11 =2 and (c) 12-54 projects = 3; and (3) years of smart city experience categorized as (a) 0-2 = 1; (b) 3-5= 2 and (c) 5-9 years = 3. As soon as this action was performed the level of smart city development was calculated by summing the (1) categorized number of smart city projects with the (2) total number of smart city themes affected and the (3) categorized version of the years of smart city experience variable for each municipality.

Fig. 7. Translation of smart city axes from Giffinger et. al. (2007) to 'Smart City Embassy' database

Smart city dimensions as per Giffinger et. al. (2007)		**Smart city dimensions within the 'Smart City Embassy' database**
1. Smart Governance 2. Smart Economy 3. Smart People 4. Smart Mobility 5. Smart Environment 6. Smart Living	Becomes →	1. Smart Society and Governance 2. Smart Economy and Energy 3. Smart Technology 4. Smart Mobility 5. Smart Environment 6. Smart Living

[4] For these sub-variables the standardization z-scores and the logarithmic transformations were performed parallel with the categorization procedures. Due to the fact that the differences in the analysis were minimal, the author decided to continue with the categorization procedure due the element of simplicity.

The substantive focus of the smart city strategy

Every smart city is expected to have its unique roadmap of development based on their individual needs, socio-economic configurations and political aspirations. Thus, this second dependent variable is used in order to detect the direction of the smart city development for selected municipalities. The substantive focus of the smart city strategy can be derived from the analysis of the number of smart projects and themes affected by those. Therefore, the themes containing a predominant number of projects will indicate the direction of smart city development. However, due to the fact that majority of selected cities have modest smart city experience, identifying a predominant theme is somehow difficult. Thus, in order to create a clearer image of smart city trends, the author decided to group smart city themes into two distinct categories presented below:

Fig. 8. The formation of the 'substantive focus of the smart city strategy' variable after conceptual translation

The substantive focus of the smart city strategy →

Number of projects within the

Techno-economic dimension (Smart Technology, Smart Mobility and Smart Economy and Energy)

Socio-ecologic dimension (Smart Society and Governance, Smart Environment and Smart Living)

Table 7. Operationalization of the dependent variables

Variable	Elements	Description	Source	Measurement
Level of smart city development	Total number of smart city projects (x)	The categorized version of the total number of individual smart city projects per city	http://www.smartcityembassy.nl	The sum of x + y +β where x and β are categorized versions of sub-variables
	Total number of smart city themes affected (y)	Total number of smart themes affected by the smart city projects running per municipality	http://www.smartcityembassy.nl	
	Years of smart city experience coefficient (β)	The categorized version of the number of years of smart city experience counted form the moment of first announcement/ project until 2017	Official smart city websites Online articles, presentations found via internet search engines	
The substantive focus of the smart city strategy	The direction of the smart city development for selected municipalities	The six smart city themes divided into *techno-economic* and *socio-ecologic* dimensions, with the predominant one indicating the focus of smart city strategy	http://www.smartcityembassy.nl	The percentage of smart city initiatives within the *techno-economic* dimension from the total

**Note: descriptive statistics for the dependent variables will be presented at the beginning of the next chapter*

3.3 Method of analysis

Multiple regression analysis (MRA) is considered to be a highly general and thus flexible data analytic method used for estimating the relationship between a dependent variable and one or more independent variables (Cohen et.al., 2013). MRA modeling aids in understanding how values of dependent variables vary based on the changes in the parameters of employed independent variables. Cohen et. al (2013) mention that MRA can be successfully used to test hypotheses generated by research projects in the social sciences and other scientific domains with the condition that the underlying assumptions are met: (1) linearity, (2) normality or normal distribution of residuals around the regression line, (3) independence assumption, which implies that independent variables are not strongly correlated with each other (see *Results* section) and (4) the assumption of homoscedasticity which states that the variance around the regression line is the same for all values of the predictor variable (X) (for 1, 2 and 4 see Appendix **1**).

3.4 Limitations

The following section discusses the limitations of this research design. Such limitations can be considered aspects of this paper that may negatively influence the accomplishment and the interpretation of the key study findings, which may take the form of some constraints on generalizability, applications to practice and/or utility. First of all, this project only uses 39 cases which is a relatively small sample size for a quantitative study. This aspect may affect the quality of the external validity and generalizability. In other words, our sample that represents only 10 % of the entire population and may be insufficient to draw conclusions that can be successfully generalized for the entire population. For the same reasons, the degree of internal validity, as represented by the level of statistical significance for the obtained results, may suffer. This aspect may increase the probability of encountering *type I and type II errors. Type I error* relates to the increased likelihood of wrongly accepting a false hypothesis. While *Type II error,* on the other hand, is concerned with the probability that even large differences in terms of values or variance are not presented as statistically significant. In such circumstances obtaining a level of statistical significance is very difficult, this, in turn, may lead to cases of wrongly rejecting a true hypothesis. Also, due to the fact that our selective sample does not contain any cases with "0" values for our dependent variables the problem with the internal validity relating to truncation is present, which in the end may lead to distorted estimates of possible effects between variables. Another limitation is considered the lack of available data. This aspect especially relates to the number and essence of smart city projects currently (historically) operating within selected smart cities. While the primary smart city database chosen for this research provides up-to-date information about current projects and initiatives, it is not entirely complete. During the analysis, the author noticed some smart city projects currently operating within some of the selected municipalities which were not mentioned in the *Smart City Embassy* database. Moreover, some of the projects that were terminated some time ago were omitted as well. However, due to the fact that such information pops-up chaotically within different online dimensions, it cannot be used as a reliable data. While fragmentary, the *Smart City Embassy* database provides enough information necessary to draw some distinct conclusions.

4. Results

This chapter provides the statistical information necessary for understating the relationships between the dependent and independent variables based on which we can reject or confirm the hypotheses presented in the previous sections. In order to obtain that information, the statistical software *SPSS-23* was used with a focus on the *correlation* and *multiple regression analyses*. The *correlation analysis* has the objective of checking for possible relationships between variables and their strength, while the *regression analysis* is employed in order to analyze the extent to which the variability of research specific dependent variables can be explained by the changes in the parameters of independent variables. This research uses four independent variables and each can be tested by using the simple regression analysis. However, by doing so some of the effects created by the inter-correlations between independent variables on dependent variables may be omitted, which in turn may compromise the degree of validity of obtained results. Therefore, the author used the *multiple regression analysis* which is suited for research projects containing two or more independent variables.

Dependent variable 1: The level of smart city development

This first dependent variable presents the degree of activity and comprehensiveness of the smart city strategies for selected municipalities. The original version of this variable was comprised by three distinct elements which related to (a) the number of smart city projects, (b) smart city themes affected and (c) the years of smart city experience. Immediately after data input procedures, it was noticed that one municipality (Amsterdam) was showing attributes of an extreme outliner. As a response, we decided to categorize the 'years of experience' sub-variable in order to control for such large differences between Amsterdam and the rest. This action did only partially improve the situation motivating us to categorize the 'number of smart city projects' sub-variable as well. In consequence, the differences between our cases were successfully balanced.

Table 8. Dependent variabile **I** after categorization procedures

Coefficient representing the level of smart city development

		Frequency	Percent
Valid	3	5	10,4
	4	14	29,2
	5	4	8,3
	6	3	6,3
	7	1	2,1
	8	3	6,3
	9	3	6,3
	10	2	4,2
	11	1	2,1
	15	1	2,1
	17	1	2,1
AMS →	62	1	2,1
	Total	39	81,3
Missing	System	9	18,8
Total		48	100,0

Statistics

N	Valid	39
	Missing	9
Mean		7,49
Std. Deviation		9,534
Minimum		3
Maximum		62

Adjusted level of smart city developement with project categorization

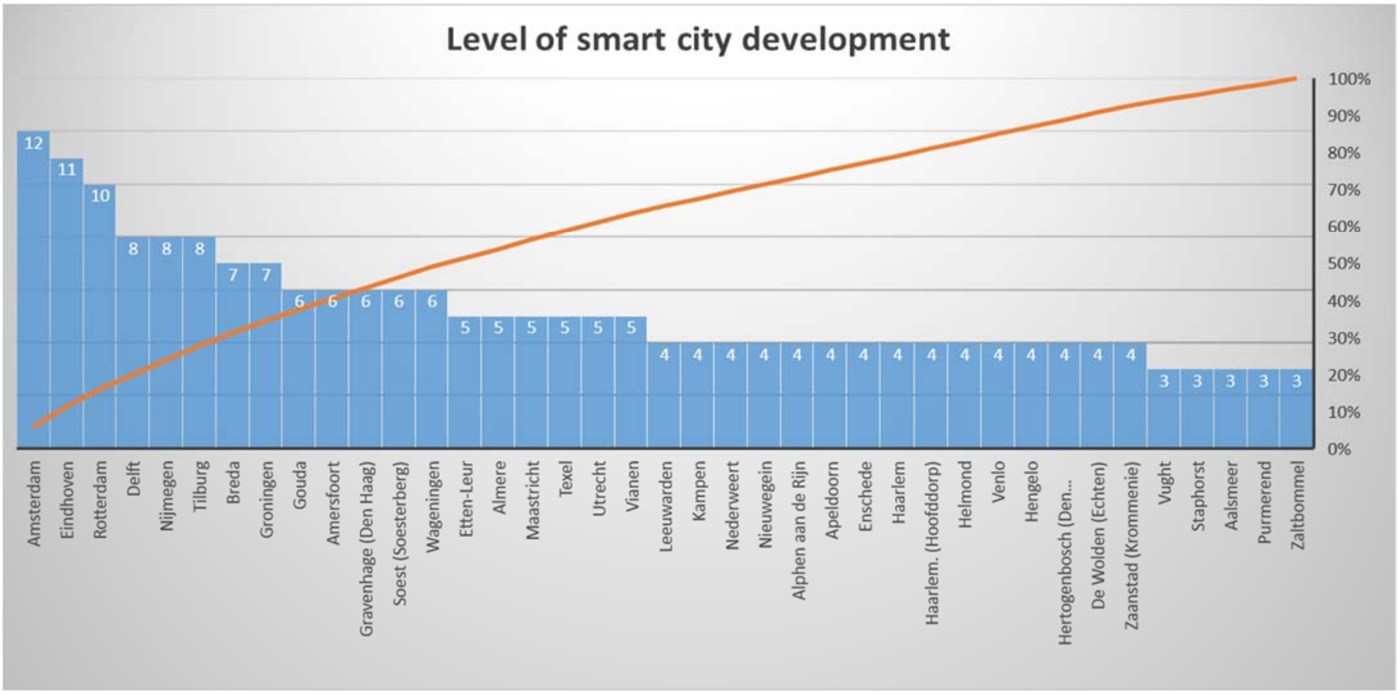
		Frequency	Percent
Valid	3,00	5	10,4
	4,00	15	31,3
	5,00	6	12,5
	6,00	5	10,4
	7,00	2	4,2
	8,00	3	6,3
	10,00	1	2,1
	11,00	1	2,1
AMS →	12,00	1	2,1
	Total	39	81,3
Missing	System	9	18,8
Total		48	100,0

Statistics

N	Valid	39
	Missing	9
Mean		5,2821
Std. Deviation		2,18787
Minimum		3,00
Maximum		12,00

Once the differences in the sample were balanced, the distribution of selected cases based on the indicators representing our first dependent variable can be performed. Thus, it can be noticed that from 39 cases approximatively 20 % have a degree of smart city development equal to or higher than 7. More exactly, 8 cities are located within this category with only 3 having values equal to or higher than 10. It can be also observed that Amsterdam (12) still holds the leading position just one point higher than Eindhoven and two points higher than Rotterdam. Interestingly, a majority of cases from our sample (around 80 %) have a degree of smart city development that ranges from 3 to 6 value points. If we take into consideration last remarks it can be concluded that majority of smart cities in the Netherlands have a low-to-medium degree of smart city development, while around 20 % show advanced levels of smart city making. Also, the municipality of Amsterdam holds an undisputable leading position in this ranking with Eindhoven and Rotterdam acting as runners-ups. Additionally, it seems that the size of the city has little impact on the degree of smart city development. Take as an example Purmerend (approx. 80,000 inhabitants) which has the lowest level of smart city development (3) and Soest (approx. 48,000 inhabitants) but with its smart city development level situated at 6.

Fig. 9. Distribution of municipalities based on values representing dependent variable **I**



Source: Author's elaboration based on the gathered data

Correlation analysis

Before commencing to the regression analysis procedures the correlation coefficients representing the level of strength between the independent variables (local economic, political and academic environments) and the first dependent variable (the level of smart city development) should be performed. Also, at this point it is important to mention that the data representing the abovementioned variables were controlled for outliers by a mix of categorizing and standardizing procedures [5]. Variables were checked for the assumptions of normality and linearity via SPSS tools and it was determined that all of them satisfy those conditions (see Appendix **1**). The Hypotheses 1, 3 and 5 all pertain to this dependent variable and will be discussed first. Hence, at first sight, the bivariate correlation analysis highlights two unexpected relationships and one that was predicted by

[5] Similar correlation and regression analyses were performed without taking into consideration variables were Amsterdam was presenting outliner attributes ('Local academic environment') with the intention to check if this municipality has a dominant impact on the correlation and regression results. Obtained results did not indicate any significant changes that might affect the adoption or rejection of research specific hypotheses. For detailed tables please see the Appendix 3.

the hypothesis 5. Thus, we predicted that the size of the local economic environment or exactly the techno-economic sector will have an impact on the level of smart city development (H1). However, *Pearson r* correlation analysis presents a statistically insignificant, weak relationship with the level of smart city development ($r = .176$, $p = .142 > 0.01$). Another unexpected element is the statistically significant, positive relationship between the local political environment and the level of smart city development ($r=.420$, $p=.004<0.01$), a result that goes against our hypothesis 3. Lastly, from the correlation matrix, it can be noticed that the local academic environment and the level of smart city development show a very strong, statistically significant relationship (H5), where $r=.715$ *and* $p = .000 < 0.01$. Nonetheless, these results are considered to be preliminary and shall be further tested by using models of multiple regression analysis which will control for possible interrelations between our predictor variables.

Table 9. Correlation analysis – the level of smart city development

Correlations

		Adjusted level of smart city developement with project categorization
Coefficient representing the local economic environment	Pearson Correlation	,176
	Sig. (1-tailed)	,142
	N	39
Coefficient representing the local political environment	Pearson Correlation	,420
	Sig. (1-tailed)	** ,004
	N	39
Coefficient representing the local academic environment	Pearson Correlation	,715
	Sig. (1-tailed)	** ,000
	N	39
Adjusted level of smart city developement with project categorization	Pearson Correlation	1
	N	39

Multiple regression analysis

The regression model used to test the hypotheses related to the first dependent variable presented some results that require attention. First of all, the *R square* $=.513$ coefficient lowers slightly if the model does the necessary adjustments relating to the number of the independent variables employed. Thus, the obtained *Adjusted R square*$=.471$ tells us that the model predicts that 47.1 % of the variance in the dependent variable can be explained by the employed independent variables. When looking at the regression coefficients it can be highlighted the fact that the impact that *local economic environment* has on the present dependent variable is considered to be statistically insignificant ($p = .710 > 0.05$). This aspect allows us to **reject** our **H1 hypothesis** and affirm that the *strength of the techno-economic sector of the local economy does not have an impact on the level of smart city development.* At the same time, while the *local political environment* presented some degree of correlation with the dependent variable in the correlation matrix, this coefficient is well diminished when the impact of all three independent variables are accounted for. Thus, due to the element of statistical insignificance ($p = .809 > 0.05$) that was observed, we can **accept** our **H3 hypothesis** and state that *the strength of leftist parties within municipal councils indeed does not affect the level of local smart city development.* Lastly, only the *local academic environment* has a statistically significant ($p = .000 < 0.05$) impact on the first dependent variable. The unstandardized coefficient $B=.710$ tells us that a point increase in the coefficient index for *the local academic environment* will produce a *.710*-point increase in the coefficient representing the *level of the smart city development*. Based on this results we can **accept** our **H5 hypothesis** and attest that the *level of strength of the local tertiary education sector does influence the level of smart city development*

Table 10. Regression analysis – the level of smart city development

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,716[a]	,513	,471	1,59061

a. Predictors: (Constant), Coefficient representing the local political environment, Coefficient representing the local economic environment, Coefficient representing the local academic environment

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,668	,943		3,888	,000
	Coefficient representing the local academic environment	,710	,157	,685	4,533	**,000
	Coefficient representing the local economic environment	,092	,246	,047	,375	***,355
	Coefficient representing the local political environment	,005	,021	,036	,244	,809

a. Dependent Variable: Adjusted level of smart city developement with project categorization

** statistically significant.
*** significance levels adjusted in order to accommodate for predicted relationships.

Dependent variable 2: The Substantive focus of the smart city strategy

Our second dependent variable indicates the prioritized direction towards which local smart city strategies are leaning by taking into consideration the number of smart city projects within the 'techno-economic' and 'socio-ecologic' dimensions. However, due to the fact that the conceptual cores of our related hypotheses (H2, H4, and H6) consider only the 'techno-economic' dimension, we will leave the aspects of the 'socio-ecologic' category aside from the analysis. Subsequently, the distribution of selected cases based on the percentage of smart city projects within the techno-economic dimension was first analyzed via a simple frequency table. The results indicated that around 55 % (20) of cities have 50 % or less of their projects concentrated in the techno-economic dimension, which logically indicates that the other 45 % (or 19) of municipalities have 50% or more of their smart city initiatives in the same category. Moreover, it seems that 5 cases show no projects related to the techno-economic aspect while another 5 have all of their efforts directed towards this direction. Lastly, 12 municipalities are believed to have a balanced approach towards smart city making with all their projects shared equally between the 'techno-economic' and 'socio-ecologic' dimensions.

Table 11. Frequency table and descriptive statistics for dependent variable **II**

Percentage of smart city projects in the techno-economic dimension

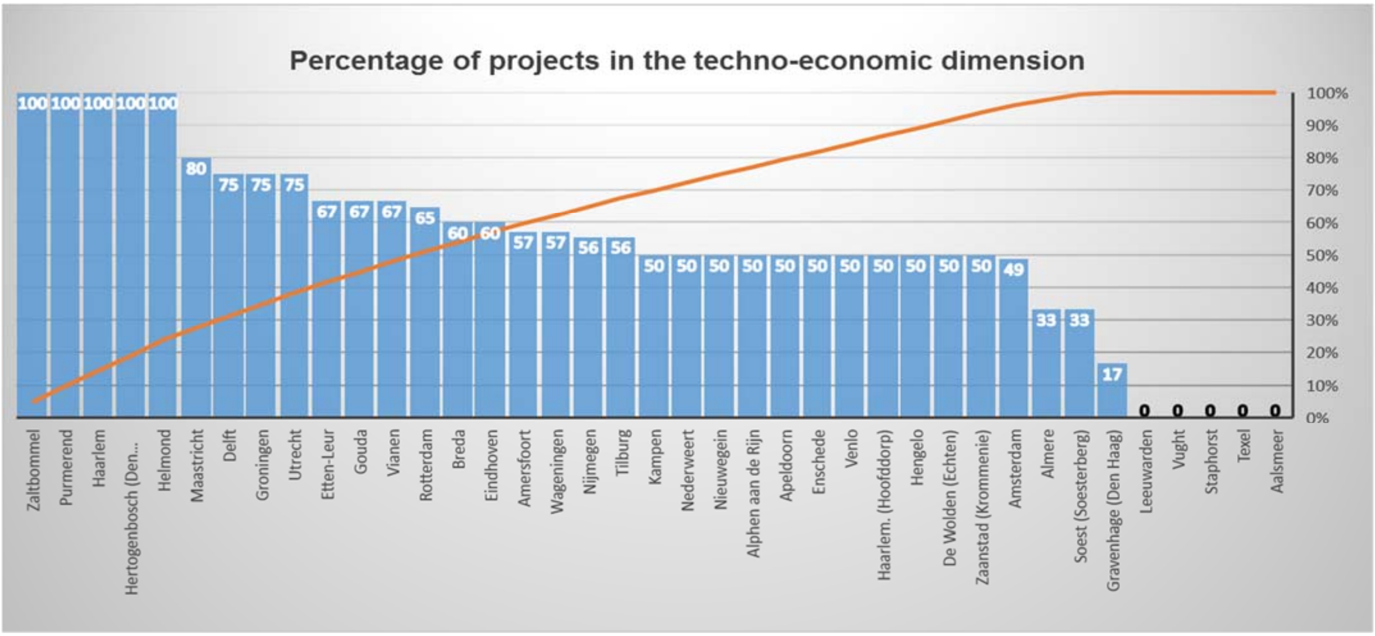
		Frequency	Percent
Valid	,00	5	10,4
	16,67	1	2,1
	33,33	2	4,2
	48,80	1	2,1
	50,00	11	22,9
	55,56	2	4,2
	57,14	2	4,2
	60,00	2	4,2
	64,71	1	2,1
	66,67	3	6,3
	75,00	3	6,3
	80,00	1	2,1
	100,00	5	10,4
	Total	39	81,3
Missing	System	9	18,8
Total		48	100,0

Statistics

N	Valid	39
	Missing	9
Mean		53,7756
Std. Deviation		28,23817
Minimum		,00
Maximum		100,00

From the graphical representation below it can be noticed that Haarlem, s-Hertogenbosch (Den Bosch), Purmerend, Zaltbommel, and Helmond have all of their efforts directed towards the techno-economic part of the smart city making. On the other side of the spectrum, there are Aalsmeer, Texel, Staphorst, Leeuwarden, and Vught which have none of their projects concerned with the techno-economic aspect. Interestingly, Amsterdam shows almost a perfectly balanced approach towards its smart city strategy with 49 % of the projects relating to the techno-economic dimension.

Fig. 9. Distribution of municipalities based on values representing dependent variable **II**



Source: Author's elaboration based on the gathered data

Correlation analysis

The hypotheses number 2, 4 and 6 are relevant for this dependent variable and will be the guide the discussion and the interpretation of the bivariate correlation results presented in the table below. First of all, local academic environment displays a very weak, insignificant relationship with the percentage of smart city projects in the techno-economic dimension (*r=.194, p =.118 > 0.05*). This aspect goes against to what we have predicted in hypothesis 2. The same thing can be stated about the relationship between the local political environment and our second dependent variable, where *r=. 195 and p =.117 > 0.05,* thus rejecting our prediction highlighted in hypothesis 4. And lastly, the aspects of the local academic focus, characterized by the percentage of faculties with technological direction, and our second dependent variable denote a weak, insignificant relationship (*r=.167 and p =.154 > 0.05)* contrary to our prediction in hypothesis 6. However, the up mentioned results have a preliminary status and can change during the multiple regression analysis test.

Table 12. Correlation analysis – the percentage of smart city projects in the techno-economic dimension

Correlations

		Percentage of smart city projects in the techno-economic dimension
Coefficient representing the local economic environment	Pearson Correlation	,194
	Sig. (1-tailed)	,118
	N	39
Coefficient representing the local political environment	Pearson Correlation	,195
	Sig. (1-tailed)	,117
	N	39
Percentage of faculties in the technological dimension per city	Pearson Correlation	,167
	Sig. (1-tailed)	,154
	N	39
Percentage of smart city projects in the techno-economic dimension	Pearson Correlation	1
	N	39

Multiple regression analysis

By looking at the regression model used to test the hypotheses related to our second dependent variable some curious facts can be noticed. The first thing to pay attention to is the *R square = .094* which implies that just around 10 % of the variance in the dependent variable is explained by our predictor variables. This number is slightly declining if the model does take into account possible interrelations between independent variables, which in result places the *Adjusted R square* at *.017.* The regression results highlight the fact that local economic environment, characterized in our case by the strength of the techno-economic sector, does not show any statistically significant (*p =.102 > 0.05)* impact on the employed dependent variable. Based on this we can **reject** our **H2 hypothesis** and state that *the strength of the local techno-economic sector does not affect the percentage of smart city projects in the techno-economic dimension.* At the same time, the local political environment does not show any sign of impact on the dependent variable. The relationship can be characterized as weak and statistically insignificant (*p =.137 > 0.05)*, thus we can **reject** our **H4 hypothesis** and state that *the strength of local leftist parties does not influence the percentage of smart city projects in the techno-economic dimension.* Lastly, the rate of faculties in the technological dimension does not present any sign of statistically significant (*p =.288 >0.05)* impact on the dependent variable. As a result, we can **reject** our **H6 hypothesis** and state that *the percentage of faculties in the technological dimension does not have an impact on the number of smart city projects in the techno-economic dimension.*

Regression assumptions

At this point, it is important to reaffirm some aspects of the MRA models used for the data analysis which can clarify the satisfaction of the assumptions specific to such models. First of all, the author noticed that the degree of intercorrelation between the explanatory variables is at best moderate, thus the danger for the presence of multicollinearity is limited. At the same time, a series of tests examining the degree of linearity and normality of distribution for variables used showed no major infringements which in turn allows us to use the MRA tools (see appendix **1).**

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,307[a]	,094	,017	28,00392

a. Predictors: (Constant), Percentage of faculties in the technological dimension per city, Coefficient representing the local economic environment, Coefficient representing the local political environment

b. Dependent Variable: Percentage of smart city projects in the techno-economic dimension

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	34,819	15,639		2,226	,033
	Coefficient representing the local political environment	,339	,305	,190	1,113	*** ,137
	Coefficient representing the local economic environment	5,344	4,130	,211	1,294	*** ,102
	Percentage of faculties in the technological dimension per city	,178	,315	,096	,565	*** ,288

a. Dependent Variable: Percentage of smart city projects in the techno-economic dimension

*** significance levels adjusted in order to accommodate for predicted relationships.

5. Discussion and Conclusion

This chapter provides a series of interpretations of the findings highlighted in the *Results* section from the theoretical and practical perspectives. This, in turn, will allow the author to provide an answer to the main research question and subsequently conclude the research.

An increasing number of municipalities worldwide chose to transit to the smart city model of urban governance. Actors from different social spheres argue that such a model of urban development may prove more inclusive, sustainable and efficient in solving socio-economic conflicts and establishing a stable growth. Smart city transitioning, as a complex urban development process, may be analyzed from the perspective of urban regime theory which sees urban models results of certain collaborative arrangements between government, business, and academia. Based on the positions and roles that each of the aforementioned actors have within urban collaborative arrangements, urban regimes may take three different forms: (1) ‘laissez-faire' – business has leading roles while other two actors have supporting roles, (2) ‘statist' – state leads the trends of urban development while other two actors provide necessary support with limited freedom for innovation and (3) ‘triple helix' – where academia obtains an equal status to other two actors and sometimes takes the initiative to start or lead some urban development projects. Based on these types of urban regimes a set of six hypotheses were developed to test at which extent do the local economic, political and academic environments influence the level of smart city development and the substantive focus of the local smart city strategies for a selective sample of 39 Dutch municipalities. Data analysis procedures were performed using SPSS-23 version and were concerned with correlation and multiple regression analyses. Deriving from the results obtain we are able to conclude that only local academic environment, or exactly the strength of the local tertiary education sector, has a statically significant impact on the level of smart city development, while the other two independent variables (strength of the local techno-economic sector and the strength of leftist parties within municipal councils) did not present any statically significant impacts on the level of smart city development. Regarding the substantive focus of the smart city strategies none of the independent variables considered showed any statistically significant impact. As a result, we can state that Dutch smart municipalities with strong tertiary education sectors might have a higher probability of showing advanced stages of smart city development than those with weak or without a tertiary sector.

From the theoretical perspective, it can be stated that only some of the theoretical implications seem to matter when we talk about the smart city making. First of all, it is evident that urban regimes, or some of the configurations of urban regimes, are successful in predicting the degree and direction of the smart city making. Contrary to the ‘laissez-faire' regime theory presented by Etzkowitz & Ranga (2015) and Stoker & Mossberger (1994) it seems that local economic environment, or exactly its strength in terms of jobs and companies in the techno-economic sector, is not a predictor of the degree of smart city development. When looking at the theoretical implications of the ‘statist' model of urban development it can be noticed that scholars place great importance on governments and their roles. Etzkowitz & Ranga (2015), for example, mention that within a ‘statist' model of development the industry and academia will be limited in their creative and innovative freedom, which will ultimately place the government in the leading position to develop and implement future strategies of urban development. Based on the theory it can be expected that the smart city making will be primarily influenced by the local political class and that the color of the political majority will be reflected in the substance of the smart city policy. However, deriving from the analysis we can observe that the strength of local political environment, in our case the portion of local councilors that share the leftist ideology, does not necessarily indicate a strong correlation with the focus on the socio-ecologic dimension of the smart city making. This aspect persuaded us to reject the Hypothesis 4. The approval of Hypothesis 3 highlights the fact that local governments, regardless of the political color (left-right) representing local council majority, have the same goal of creating socio-economic wealth and wellbeing for the communities they represent. Thus, political color does not play a role when local governments develop and implement strategies of smart city development, which is ultimately seen as an effective urban model to achieve pre-established goals of growth and wellbeing. Lastly, the ‘triple helix’ regime of urban development implies the active involvement of the academia in shaping the trends of urban development. It is important to mention that scholars involve practical and functional reasons behind adding academia to the historically predominant government-industry dyadic relationships. Etzkowitz & Ranga (2015) and Benneworth et.al. (2015) argue that the involvement of academia can help unblock potential deadlocks that may appear in the processes of local decision-making. Moreover, the previously mentioned scholars add that the importance of university within the urban sphere upgraded when the later achieved the status of a business agent which has congregated great amounts of know-how and technology resources available at its disposal. Based on the theoretical indications we can suggest that a 'triple helix' regime may be less prone to deadlocks and present higher amounts of resources available for actors involved in urban reshaping and thus improve the quality of smart city development. This idea was confirmed by our Hypothesis 5 which indicated, with a strong statistical significance, that the strength of local academic environment, exactly the strength of the local tertiary education sector, does indeed influence the level of smart city development. Nonetheless, it seems that the scientific focus of the local tertiary education sector, measured as the percentage of technological faculties operating within municipalities, does not necessarily influence the substantive focus of the smart city strategy as proved by the rejection of Hypothesis 6.

When translating the research results into practical matters few assumptions can be established. First of all, it appears like the academic environment seems to matter more than the economic and political sectors when we talk about the smart city making in the Netherlands. Based on our results it appeared that cities which possess strong tertiary education sectors have higher chances of showing advanced stages of smart city development than those that don't. It seems that the economic and political environments are relative 'stable', in terms that they operate based on specific shared principles uniformly practiced throughout the country, thus a change in the aspects of political ideology of the local ruling class or differences in the number and types of locally operating businesses (also jobs) does not present any strong differentiation in the aspects of smart city development for the analyzed municipalities. The key to smart city success it appears to lie in the academic sector which indeed has the power to dissolve deadlocks, speed up the decision-making and bring to the table high quality know-how, labor and technology resources. This major finding may prove to be beneficial for policymakers and businesses interested to initiate smart city making processes or penetrate related markets. As a result, all participating actors may be able to save money, time and efforts by focusing on cities that have stronger bases of tertiary education. On the other hand, if only cities with such resources are selected for smart city development, there is a chance that the aspects of the 'National Smart City Strategy' may progress unevenly across the country. This problem calls for active collaboration between municipalities in terms of opening the 'knowledge' and 'know-how' resources for cities that have not developed yet a strong academic base. A better understating is needed of how and why exactly some aspects of urban environments matter more than other when we talk about models of smart city development. Future research shall focus more on the dimensions of urban environments that can act as catalysts or inhibitors of urban transitions.

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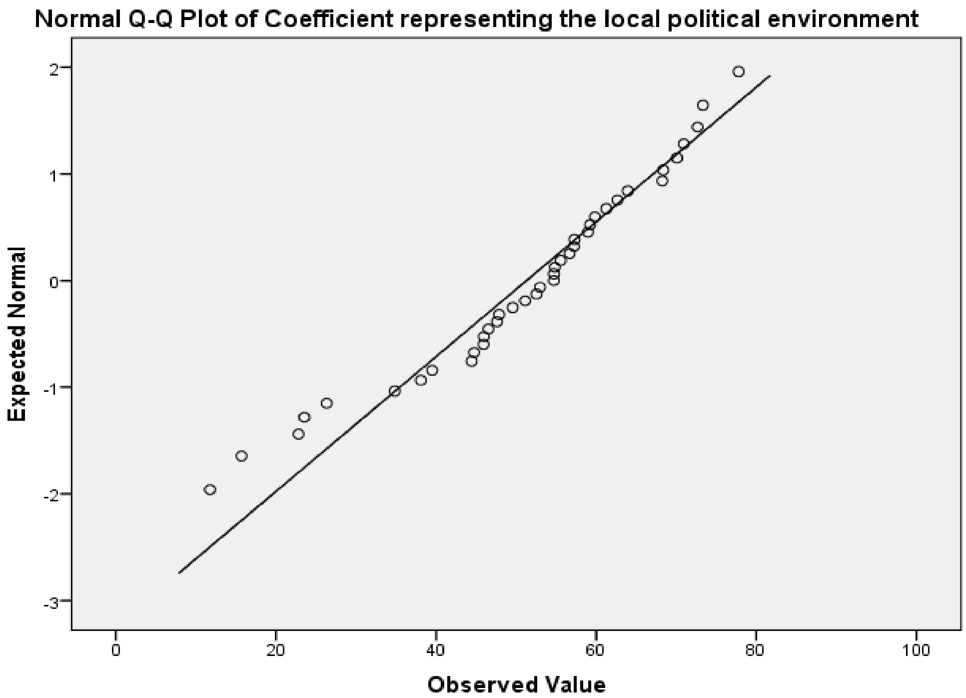
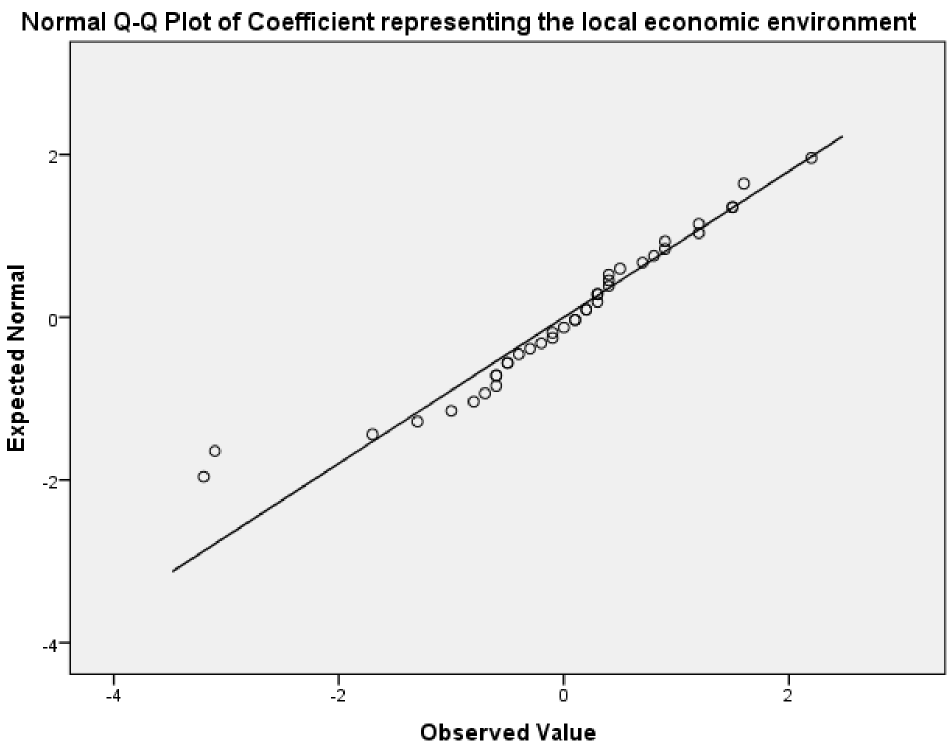
Appendixes

Appendix 1. Normality test for research specific variables.





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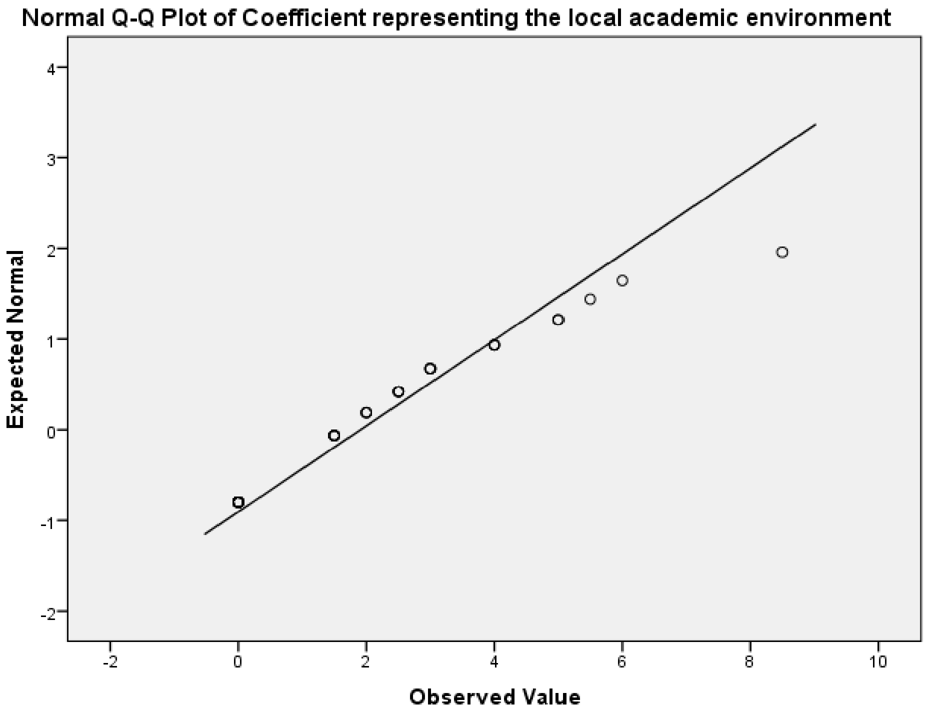

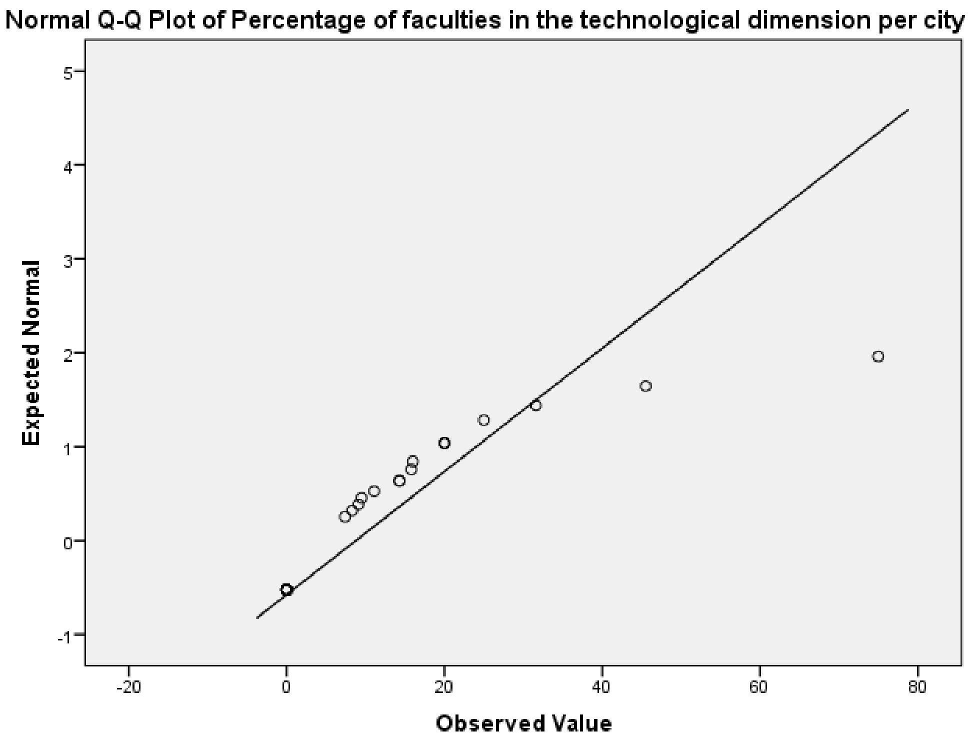

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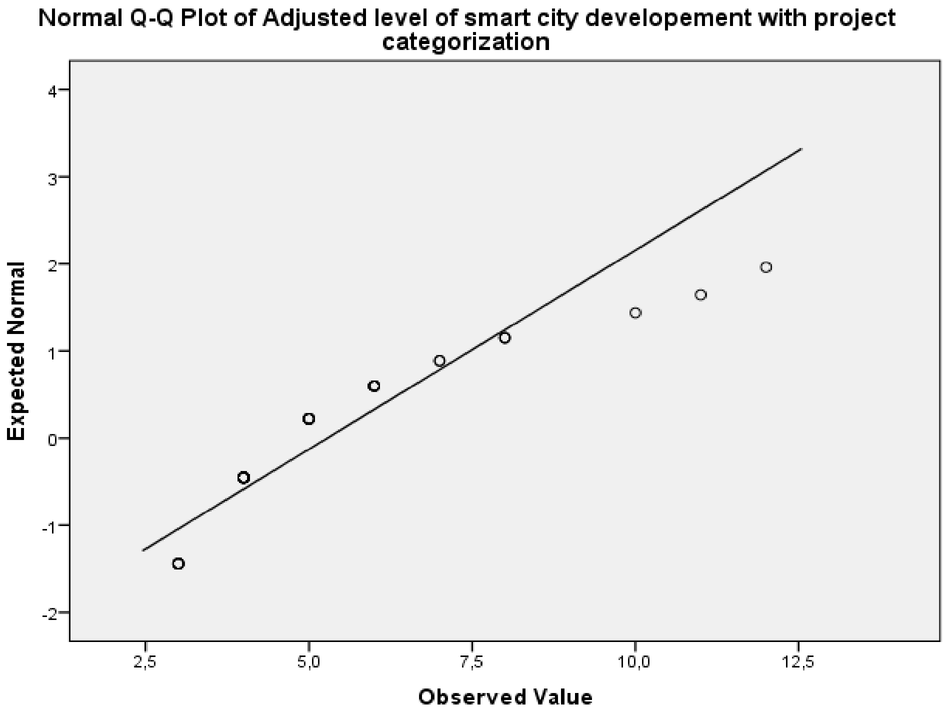

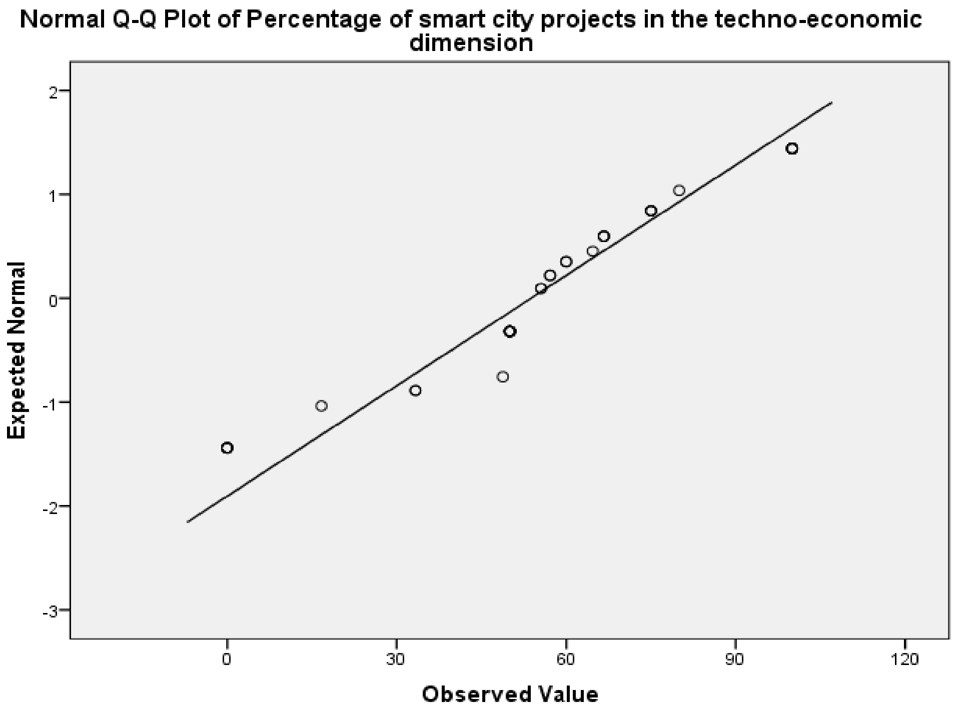

Appendix 2. Complete Correlation analysis tables.

Correlation dependent variable – the level of smart city development.

Correlations

		Coefficient representing the local economic environment	Coefficient representing the local political environment	Coefficient representing the local academic environment	Adjusted level of smart city developement with project categorization
Coefficient representing the local economic environment	Pearson Correlation	1	-,116	,195	,176
	Sig. (1-tailed)		,241	,117	,142
	N	39	39	39	39
Coefficient representing the local political environment	Pearson Correlation	-,116	1	,567**	,420**
	Sig. (1-tailed)	,241		,000	,004
	N	39	39	39	39
Coefficient representing the local academic environment	Pearson Correlation	,195	,567**	1	,715**
	Sig. (1-tailed)	,117	,000		,000
	N	39	39	39	39
Adjusted level of smart city developement with project categorization	Pearson Correlation	,176	,420**	,715**	1
	Sig. (1-tailed)	,142	,004	,000	
	N	39	39	39	39

**. Correlation is significant at the 0.01 level (1-tailed).

Correlation dependent variable – the percentage of smart cities in the techno-economic dimension.

Correlations

		Coefficient representing the local economic environment	Coefficient representing the local political environment	Percentage of faculties in the technological dimension per city	Percentage of smart city projects in the techno-economic dimension
Coefficient representing the local economic environment	Pearson Correlation	1	-,116	,060	,194
	Sig. (1-tailed)		,241	,358	,118
	N	39	39	39	39
Coefficient representing the local political environment	Pearson Correlation	-,116	1	,309*	,195
	Sig. (1-tailed)	,241		,028	,117
	N	39	39	39	39
Percentage of faculties in the technological dimension per city	Pearson Correlation	,060	,309*	1	,167
	Sig. (1-tailed)	,358	,028		,154
	N	39	39	39	39
Percentage of smart city projects in the techno-economic dimension	Pearson Correlation	,194	,195	,167	1
	Sig. (1-tailed)	,118	,117	,154	
	N	39	39	39	39

*. Correlation is significant at the 0.05 level (1-tailed).

Appendix 3. Correlation and regression analyses dep. var. II, without outliers.

Correlation analysis 'level of smart city development' variable with excluded outliers (Amsterdam).

Correlations

		Coefficient representing the local political environment	Coefficient representing the local economic environment	Coefficient representing the local academic environment	Adjusted level of smart city developement with project categorization
Coefficient representing the local political environment	Pearson Correlation	1	-,116	,517	,338
	Sig. (1-tailed)		,241	,000	,019
	N	39	39	38	38
Coefficient representing the local economic environment	Pearson Correlation	-,116	1	,097	,076
	Sig. (1-tailed)	,241		,281	,324
	N	39	39	38	38
Coefficient representing the local academic environment	Pearson Correlation	,517	,097	1	,615
	Sig. (1-tailed)	,000	,281		,000
	N	38	38	38	38
Adjusted level of smart city developement with project categorization	Pearson Correlation	,338	,076	,615	1
	Sig. (1-tailed)	,019	,324	,000	
	N	38	38	38	38

Regression analysis 'level of smart city development' variable with excluded outliers (Amsterdam).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,616[a]	,380	,325	1,57272

a. Predictors: (Constant), Coefficient representing the local political environment, Coefficient representing the local economic environment, Coefficient representing the local academic environment

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,803	,938		4,054	,000
	Coefficient representing the local academic environment	,619	,169	,594	3,663	,001
	Coefficient representing the local economic environment	,045	,246	,026	,182	,857
	Coefficient representing the local political environment	,005	,020	,036	,222	,826

a. Dependent Variable: Adjusted level of smart city developement with project categorization

Appendix 4. Indicators representing local tertiary academic environment (2018).

City Name	MBO universities (0,5)		WO universities (1)		Agg. Coefficient (MBO+WO) x	Number of faculties	Faculty category coefficient y (0 = 0 1-10 = 1 11-20 = 2 21-up = 3)	City academic coefficient (x+y)	Tech faculties		Non-Tech faculties	
	Number	Coefficient	Number	Coefficient					Number	%	Number	%
1.Aalsmeer	0	0	0	0	0	0	0	0	0	0	0	0
2.Almere	1	0,5	0	0	0,5	1	1	1,5	0	0	1	100
3.Alphen aan de Rijn	0	0	0	0	0	0	0	0	0	0	0	0
4.Amersfoort	1	0,5	0	0	0,5	5	1	1,5	0	0	5	100
5.Amsterdam	5	2,5	3	3	5,5	42	3	8,5	4	9,5	38	90,5
6.Apeldoorn	1	0,5	1	1	1,5	3	1	2,5	0	0,0	3	100,0
7.Breda	2	1	0	0	1	14	2	3	2	14,3	12	85,7
8.Delft	2	1	1	1	2	12	2	4	9	75	3	25
9.Eindhoven	2	1	1	1	2	22	3	5	10	45,5	12	54,5
10.Enschede	2	1	1	1	2	19	2	4	6	31,6	13	68,4
11.Etten-Leur	0	0	0	0	0	0	0	0	0	0,0	0	0,0
12.Gouda	1	0,5	0	0	0,5	1	1	1,5	0	0	1	100,0
13.Gravenhage (Den Haag)	4	2	1	1	3	20	2	5	4	20	16	80
14.Groningen	2	1	2	2	3	25	3	6	4	16,0	21	84,0
15.Haarlem	1	0,5	0	0	0,5	5	1	1,5	1	20,0	4	80
16.Haarlemmermeer	0	0	0	0	0	0	0	0	0	0,0	0	0
17.Helmond	1	0,5	0	0	0,5	1	1	1,5	0	0,0	1	100
18.Hengelo	0	0	0	0	0	0	0	0	0	0,0	0	0
19.Hertogenbosch	3	1,5	0	0	1,5	11	2	3,5	1	9,1	10	90,9
20.Kampen	0	0	1	1	1	1	1	2	0	0,0	1	100,0
21.Leeuwarden	2	1	0	0	1	19	2	3	3	15,8	16	84,2
22.Maastricht	1	0,5	1	1	1,5	15	2	3,5	3	20	12	80
23.Nederweert	0	0	0	0	0	0	0	0	0	0	0	0
24.Nieuwegein	0	0	0	0	0	0	0	0	0	0	0	0
25.Nijmegen	2	1	1	1	2	12	2	4	1	8,3	11	91,7
26.Purmerend	0	0	0	0	0	0	0	0	0	0,0	0	0,0
27.Rotterdam	5	2,5	1	1	3,5	27	3	6,5	2	7,4	25	92,6
28.Soest	0	0	0	0	0	0	0	0	0	0,0	0	0,0
29.Staphorst	0	0	0	0	0	0	0	0	0	0,0	0	0,0
30.Texel	0	0	0	0	0	0	0	0	0	0,0	0	0,0
31.Tilburg	2	1	1	1	2	18	2	4	2	11,1	16	88,9
32.Utrecht	4	2	2	2	4	28	3	7	4	14,3	24	85,7
33.Venlo	2	1	0	0	1	8	1	2	2	25,0	6	75,0
34.Vianen	0	0	0	0	0	0	0	0	0	0,0	0	0,0
35.Vught	0	0	0	0	0	0	0	0	0	0,0	0	0,0
36.Wageningen	1	0,5	1	1	1,5	6	1	2,5	0	0,0	6	100,0
37.de Wolden	0	0	0	0	0	0	0	0	0	0,0	0	0,0
38.Zaanstad	0	0	0	0	0	0	0	0	0	0,0	0	0,0
39.Zaltbommel	0	0	0	0	0	0	0	0	0	0,0	0	0,0

Appendix 5. Indicators representing local economic environment (2010).

City Name	Local economic environment in 2010																					
	SPSS ID number	Total # of companies per city	Total # of jobs per city x1000	Industry (1)		Energy (2)		Construction (3)		Trade (4)		Transportation (5)		Info. & Com. (6)		Total # of Jobs within selected sectors x1000 (∑1, 2, 3, 4, 5, 6)	% from the total # of jobs	Z-score (jobs)	Total # of companies within selected sectors (∑1, 2, 3, 4, 5, 6)	Total # of companies within selected sectors (Log version)	z-score (companies)	Level of strength
				#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)							
1.Aalsmeer	1	2685	15,1	1,2	130	0	0	0,4	250	5,3	720	0,6	70	0,2	90	7,7	51,0	0,98	1260,0	3,1	-0,88	0,11
2.Almere	2	11615	66,1	4,3	415	0,4	5	2,5	1260	16	2450	1,9	430	2,2	1040	27,3	41,3	0,15	5600,0	3,7	0,70	0,85
3.Alphen aan de Rijn	3	5040	32,3	2,9	210	0,2	0	1,5	560	7,9	1065	1,3	115	0,9	325	14,7	45,5	0,51	2275,0	3,4	-0,25	0,26
4.Amersfoort	4	10360	83,5	5,9	365	0,2	10	3,9	755	13,1	1935	4	175	4,9	860	32,0	38,3	-0,11	4100,0	3,6	0,37	0,26
5.Amsterdam	5	83145	537,1	14	2110	7,7	35	10	4540	68	12890	18,8	2680	30,5	7655	149,0	27,7	-1,02	29910,0	4,5	2,48	1,46
6.Apeldoorn	6	10335	91,4	8,4	455	0,2	5	4	840	11,4	2275	2,5	195	3,1	590	29,6	32,4	-0,62	4360,0	3,6	0,44	-0,18
7.Breda	7	13570	101,3	7,6	550	0,7	5	5,4	1210	16,7	2930	3,9	330	2,1	710	36,4	35,9	-0,32	5735,0	3,8	0,73	0,41
8.Delft	8	6120	51,5	3,7	205	0,2	5	1,2	575	6,8	1005	1,4	100	2,8	640	16,1	31,3	-0,72	2530,0	3,4	-0,14	-0,86
9.Eindhoven	9	15595	158,4	18,1	680	0,7	5	4,9	1340	19,4	3155	6,9	355	8,4	1175	58,4	36,9	-0,24	6710,0	3,8	0,89	0,66
10.Enschede	10	9380	78,6	18,1	490	0,2	5	2,4	820	11,3	2475	2,6	175	3,2	655	37,8	48,1	0,73	4620,0	3,7	0,50	1,23
11.Etten-Leur	11	2895	21,3	4,9	195	0,2	0	1	365	3,9	640	1	80	0,3	125	11,3	53,1	1,16	1405,0	3,1	-0,76	0,40
12.Gouda	12	4480	39,3	3,4	160	0,1	0	1,4	625	5,4	910	0,7	85	1,7	285	12,7	32,3	-0,63	2065,0	3,3	-0,35	-0,98
13.Gravenhage (Den Haag)	13	38355	276,3	7	970	1,3	5	6,6	5440	25,8	6515	9,7	780	11,8	2080	62,2	22,5	-1,47	15790,0	4,2	1,80	0,33
14.Groningen	14	12220	130,9	8,7	495	0,2	5	4,5	835	14,7	2355	2,5	290	7,3	1155	37,9	29,0	-0,92	5135,0	3,7	0,61	-0,31
15.Haarlem	15	11830	68	5,8	410	0,2	0	1,6	1545	10,5	2215	2,1	175	2,4	785	22,6	33,2	-0,55	5130,0	3,7	0,61	0,06

Appendix 5. Continued from previous page.

City Name	Local economic environment in 2010																					
	SPSS ID number	Total # of companies per city	Total # of jobs per city x1000	Industry (1)		Energy (2)		Construction (3)		Trade (4)		Transportation (5)		Info. & Com. (6)		Total # of Jobs within selected sectors x1000 (∑1, 2, 3, 4, 5, 6)	% from the total # of jobs	Z-score (jobs)	Total # of companies within selected sectors (∑1, 2, 3, 4, 5, 6)	Total # of companies within selected sectors (Log version)	z-score (companies)	Level of strength
				#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)							
16.Haarlemmermeer	16	12600	140,2	11,2	490	0,8	10	3,9	1310	20,8	2710	35,8	740	5	675	77,5	55,3	1,35	5935,0	3,8	0,76	2,12
17.Helmond	17	5755	38,4	6,6	385	0,2	0	2	775	7	1375	1,1	110	0,3	235	17,2	44,8	0,45	2880,0	3,5	0,00	0,45
18.Hengelo	18	5205	45,8	8	335	0,6	5	1,9	410	7,8	1310	1	100	1	310	20,3	44,3	0,41	2470,0	3,4	-0,16	0,24
19.Hertogenbosch	19	12220	102,2	7,2	485	0,2	25	4,7	1450	17,4	2530	3,8	200	5	710	38,3	37,5	-0,18	5400,0	3,7	0,66	0,48
20.Kampen	20	3315	19,3	2,5	195	0,1	0	1,3	525	3,5	695	1,1	95	0,2	95	8,7	45,1	0,47	1605,0	3,2	-0,62	-0,15
21.Leeuwarden	21	5750	67,3	3,9	270	1,1	5	1,7	555	7,3	1435	1,3	115	1,9	355	17,2	25,6	-1,21	2735,0	3,4	-0,06	-1,27
22.Maastricht	22	7795	74,5	7,2	325	0,2	5	1,7	580	9,8	1815	2	155	2,5	345	23,4	31,4	-0,71	3225,0	3,5	0,12	-0,59
23.Nederweert	23	1525	4,9	0,6	120	0,2	0	0,5	185	0,9	270	0,2	35	0,1	35	2,5	51,0	0,98	645,0	2,8	-1,59	-0,60
24.Nieuwegein	24	4170	46,7	1,5	170	0,2	0	2,6	440	7,3	915	2,7	160	5,8	350	20,1	43,0	0,30	2035,0	3,3	-0,37	-0,07
25.Nijmegen	25	9910	99,4	8,9	415	0,8	5	2,5	840	11,4	2040	2,7	235	2,2	660	28,5	28,7	-0,94	4195,0	3,6	0,40	-0,55
26.Purmerend	26	4435	25,7	1,7	195	0,3	0	0,9	585	5,1	1060	1,3	190	0,4	235	9,7	37,7	-0,16	2265,0	3,4	-0,26	-0,42
27.Rotterdam	27	42375	376,4	24,6	1645	5,4	35	14,8	4035	44,2	8555	31	2055	9,1	2560	129,1	34,3	-0,46	18885,0	4,3	1,99	1,53
28.Soest	28	4060	16,7	1,4	165	0,2	0	0,7	430	3,4	820	0,6	55	0,3	215	6,6	39,5	-0,01	1685,0	3,2	-0,57	-0,58
29.Staphorst	29	1375	5,6	1,4	100	0,2	5	0,6	240	1,3	270	0,3	35	0	20	3,8	67,9	2,44	670,0	2,8	-1,55	0,89
30.Texel	30	1730	5,8	0,3	80	0,2	0	0,3	170	1	275	0,3	50	0,1	45	2,2	37,9	-0,14	620,0	2,8	-1,63	-1,77

Appendix 5. Continued from previous page.

City Name	Local economic environment in 2010																					
	SPSS ID number	Total # of companies per city	Total # of jobs per city x1000	Industry (1)		Energy (2)		Construction (3)		Trade (4)		Transportation (5)		Info. & Com. (6)		Total # of Jobs within selected sectors x1000 (∑1, 2, 3, 4, 5, 6)	% from the total # of jobs	Z-score (jobs)	Total # of companies within selected sectors (∑1, 2, 3, 4, 5, 6)	Total # of companies within selected sectors (Log version)	z-score (companies)	Level of strength
				#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)	#jobs (x1000)	#co (absolute)							
31.Tilburg	31	13105	124,2	11,9	695	0,2	0	3,2	1450	15,7	2915	5,7	245	1,3	715	38,0	30,6	-0,78	6020,0	3,8	0,78	0,00
32.Utrecht	32	23835	238,9	7,8	675	1,4	10	6,7	1650	23,7	3735	13,8	510	16,5	2230	69,9	29,3	-0,89	8810,0	3,9	1,18	0,29
33.Venlo	33	6390	59,3	11,3	390	0,2	0	1,4	515	11,5	1695	4,5	230	0,4	195	29,3	49,4	0,85	3025,0	3,5	0,05	0,90
34.Vianen	34	1525	10,7	0,6	80	0,2	0	1,8	230	3,4	340	0,4	60	1,1	80	7,5	70,1	2,63	790,0	2,9	-1,37	1,26
35.Vught	35	2085	11,7	0,1	60	0,2	0	0,5	245	1,2	340	0,1	20	0,1	80	2,2	18,8	-1,79	745,0	2,9	-1,43	-3,23
36.Wageningen	36	2045	16,2	0,4	90	0,2	0	0,3	145	1,6	365	0,4	20	0,4	150	3,3	20,4	-1,66	770,0	2,9	-1,40	-3,06
37.de Wolden	37	2070	4,5	0,2	95	0,2	0	0,4	240	0,9	375	0,3	60	0,1	60	2,1	46,7	0,61	830,0	2,9	-1,32	-0,71
38.Zaanstad	38	9750	55,4	7,5	685	0,2	5	4,5	1670	12,7	1960	2,6	340	0,6	455	28,1	50,7	0,96	5115,0	3,7	0,61	1,57
39.Zaltbommel	39	2600	14,2	1,2	150	0	5	0,8	330	2,8	485	0,7	105	0,9	130	6,4	45,1	0,47	1205,0	3,1	-0,92	-0,45
																X̄ =	*39,6*		Ȳ =	3,46		
																SD=	*11,6*		SD=	*0,41*		

Appendix 6. Indicators representing the level of smart city development and smart city substantive focus (2018).

Smart city/ Themes	Smart Technology 1	Smart Mobility 2	Smart Economy and Energy 3	Smart Society and Governance 4	Smart Environment 5	Smart Living 6	*Total Individual Projects*	*Total Individual projects (categorized) 1-5 = 1; 6-11 =2 12-54 = 3 (C1)*	*Themes Affected (C2)*	*Years of Smart City Experience*	*Years of Experience (categorized) 0-2=1 3-5=2 5-9=3 (C3)*	*Smart City Development level (C1+C2+C3)*	Substantive focus of the smart city strategy				Total initiatives
													Techno-economic dimension (1+2+3)	% from total	Socio-ecologic dimension (4+5+6)	% from total	
1.Aalsmeer	0	0	0	0	1	0	1	1	1	1	1	3	0	0,00	1	100,00	1
2.Almere	0	0	1	0	2	0	2	1	2	4	2	5	1	33,33	2	66,67	3
3.Alphen aan de	1	0	0	0	0	1	1	1	2	1	1	4	1	50,00	1	50,00	2
4.Amersfoort	3	0	1	0	2	1	4	1	4	2	1	6	4	57,14	3	42,86	7
5.Amsterdam	19	16	26	19	31	14	53	3	6	8	3	12	61	48,80	64	51,20	125
6.Apeldoorn	0	0	1	0	1	0	1	1	2	1	1	4	1	50,00	1	50,00	2
7.Breda	1	1	1	0	1	1	2	1	5	2	1	7	3	60,00	2	40,00	5
8.Delft	1	2	3	0	1	1	3	1	5	3	2	8	6	75,00	2	25,00	8
9. Eindhoven	3	4	2	1	3	2	6	2	6	6	3	11	9	60,00	6	40,00	15
10. Enschede	1	0	0	0	1	0	1	1	2	1	1	4	1	50,00	1	50,00	2
11.Etten-Leur	1	0	1	0	1	0	1	1	3	1	1	5	2	66,67	1	33,33	3
12.Gouda	4	1	3	0	4	0	4	1	4	2	1	6	8	66,67	4	33,33	12
13.Gravenhage (Den Haag)	1	0	0	3	1	1	3	1	4	1	1	6	1	16,67	5	83,33	6
14. Groningen	1	2	3	1	0	1	3	1	5	2	1	7	6	75,00	2	25,00	8
15.Haarlem	1	1	0	0	0	0	1	1	2	1	1	4	2	100,00	0	0,00	2
16.Haarlemmermeer (Hoofddorp)	0	0	2	0	2	0	2	1	2	1	1	4	2	50,00	2	50,00	4
17.Helmond	1	1		0	0	0	1	1	2	1	1	4	2	100,00	0	0,00	2
18.Hengelo	0	0	1	0	1	0	1	1	2	1	1	4	1	50,00	1	50,00	2
19.Hertogenbosch (Den Bosch)	0	1	1	0	0	0	1	1	2	1	1	4	2	100,00	0	0,00	2
20.Kampen	0	0	1	0	1	0	1	1	2	1	1	4	1	50,00	1	50,00	2

Appendix 6. Continued from previous page.

Smart city/ Themes	Smart Technology 1	Smart Mobility 2	Smart Economy and Energy 3	Smart Society and Governance 4	Smart Environment 5	Smart Living 6	*Total Individual Projects*	*Total Individual projects (categorized) 1-5 = 1; 6-11 =2 12-54 = 3 (C1)*	*Themes Affected (C2)*	*Years of Smart City Experience*	*Years of Experience (categorized) 0-2=1 3-5=2 5-9=3 (C3)*	*Smart City Development level (C1+C2+C3)*	Substantive focus of the smart city strategy				Total initiatives
													Techno-economic dimension (1+2+3)	% from total	Socio-ecologic dimension (4+5+6)	% from total	
21.Leeuwarden	0	0	0	0	1	1	*1*	*1*	*2*	*1*	*1*	*4*	***0***	***0,00***	***2***	***100,00***	2
22.Maastricht	2	0	2	0	1	0	*2*	*1*	*3*	*1*	*1*	*5*	***4***	***80,00***	***1***	***20,00***	5
23.Nederweert	0	0	1	0	1	0	*1*	*1*	*2*	*1*	*1*	*4*	***1***	***50,00***	***1***	***50,00***	2
24.Nieuwegein	0	0	1	0	1	0	*1*	*1*	*2*	*1*	*1*	*4*	***1***	***50,00***	***1***	***50,00***	2
25. Nijmegen	1	2	2	1	2	1	*4*	*1*	*6*	*2*	*1*	*8*	***5***	***55,56***	***4***	***44,44***	9
26.Purmerend	0	0	1	0	0	0	*1*	*1*	*1*	*1*	*1*	*3*	***1***	***100,00***	***0***	***0,00***	1
27. Rotterdam	3	4	4	1	5	0	*9*	*2*	*6*	*4*	*2*	*10*	***11***	***64,71***	***6***	***35,29***	17
28.Soest (Soesterberg)	1	0	1	2	2	0	*2*	*1*	*4*	*1*	*1*	*6*	***2***	***33,33***	***4***	***66,67***	6
29.Staphorst	0	0	0	0	1	0	*1*	*1*	*1*	*1*	*1*	*3*	***0***	***0,00***	***1***	***100,00***	1
30.Texel	0	0	0	1	1	1	*1*	*1*	*3*	*2*	*1*	*5*	***0***	***0,00***	***3***	***100,00***	3
31. Tilburg	2	2	1	1	2	1	*3*	*1*	*6*	*2*	*1*	*8*	***5***	***55,56***	***4***	***44,44***	9
32. Utrecht	0	2	1	0	0	1	*2*	*1*	*3*	*2*	*1*	*5*	***3***	***75,00***	***1***	***25,00***	4
33.Venlo	0	0	1	0	1	0	*1*	*1*	*2*	*1*	*1*	*4*	***1***	***50,00***	***1***	***50,00***	2
34.Vianen	1	0	1	0	0	1	*1*	*1*	*3*	*1*	*1*	*5*	***2***	***66,67***	***1***	***33,33***	3
35.Vught	0	0		0	1	0	*1*	*1*	*1*	*1*	*1*	*3*	***0***	***0,00***	***1***	***100,00***	1
36.Wageningen	1	1	2	0	3	0	*3*	*1*	*4*	*1*	*1*	*6*	***4***	***57,14***	***3***	***42,86***	7
37.de Wolden (Echten)	0	0	1	0	1	0	*1*	*1*	*2*	*1*	*1*	*4*	***1***	***50,00***	***1***	***50,00***	2
38.Zaanstad (Krommenie)	0	0	1	0	1	0	*1*	*1*	*2*	*1*	*1*	*4*	***1***	***50,00***	***1***	***50,00***	2
39.Zaltbommel	1	0	0	0	0	0	*1*	*1*	*1*	*1*	*1*	*3*	***1***	***100,00***	***0***	***0,00***	1

Appendix 7. Identified local left-wing parties (for 2006, 2010 and 2014 electoral cycles).

Aalsmeer		
2006	2010	2014
PACT A.B.	PACT A.B.	PACT A.B. Aalsmeers Collectief

Alphen aan de Rijn		
2006	2010	2013
	Nieuw Elan	Nieuw Elan RGL

Almere		
2006	2010	2014
Leefbaar Almere Almere Partij	Leefbaar Almere	Leefbaar Almere Almere Partij

Amersfoort		
2006	2010	2014
Burger Partij Amersfoort	Burger Partij Amersfoort	Burger Partij Amersfoort

Apeldoorn		
2006	2010	2014
Leefbaar Apeldoorn	Leefbaar Apeldoorn	Leefbaar Apeldoorn PSA

Breda		
2006	2010	2014
Leefbaar-Breda Breda '97	Leefbaar-Breda Breda '97	Breda '97

Delft		
2006	2010	2014
Leefbaar Delft Stadsbelangen	Leefbaar Delft Stadsbelangen	Stadsbelangen

Den Bosch (s-Hertogenbosch)		
2006	2010	2014
Leefbaar 's-Hertogenbosch Stadspartij Knillis Bosch Belang Rosmalens Belang	Leefbaar 's-Hertogenbosch Stadspartij Knillis Bosch Belang Rosmalens Belang	Bosch Belang Rosmalens Belang De Bossche Groenen

Den Haag (Gravenhage)		
2006	2010	2014
Haagse Stadspartij Solidair Nederland	Haagse Stadspartij	Haagse Stadspartij

Eindhoven		
2006	2010	2014
Leefbaar Eindhoven	Leefbaar Eindhoven	Leefbaar Eindhoven

Enschede		
2006	2010	2014
	Enschede Solidair	

Etten-Leur		
2006	2010	2014
Ons Etten-Leur	Ons Etten-Leur	Ons Etten-Leur Leefbaar Etten-Leur

Groningen		
2006	2010	2014
Stadspartij	Stadspartij	Stadspartij

Haarlem		
2006	2010	2014
Axielijst	Actiepartij Ouderen Partij Haarlem	Actiepartij Ouderen Partij Haarlem

Helmond		
2006	2010	2014
Soc. Dem. Helmond Leefbaar Helmond Helder Helmond Helmond Aktief	Soc. Dem. Helmond Leefbaar Helmond Helder Helmond Helmond Aktief	SDH/OH/Helmondse LH Helder Helmond Helmond Aktief

Haarlemmermeer		
2006	2010	2014
Leefbaar Haarlemmermeer	HAP	HAP

Appendix 7. Continued from previous page.

Zaanstad		
2006	2010	2014
ROSA	ROSA	ROSA

Maastricht		
2006	2010	2014
	Christelijke Volks Partij	Maastrichtse Volkspartij (MV) Partij Veilig Maastricht (PVM)

Leeuwarden		
2006	2010	2014
		Verenigd Links-Feriene Lofts

Nederweert		
2006	2010	2014
Leefbaar Nieuwegein		

Nieuwegein		
2006	2010	2014
Onze Nieuwegeinse Samenlevin (O.N.S) Leefbaar Nieuwegein	LEEFBAAR NIEUWEGEIN O.N.S	

Soest		
2006	2010	2014
Gemeentebelangen Groen Soest (G.G.S)	(G.G.S)	(G.G.S) Burgerbelangen Soest Democraten Soest Natuurlijk

Texel		
2006	2010	2014
Texels Belang	Texels Belang	Texels Belang

Tilburg		
2006	2010	2014
Tilburgse Volkspartij (TVP)	Tilburgse Volkspartij (TVP)	Tilburgse Volkspartij (TVP)

Utrecht		
2006	2010	2014
Leefbaar Utrecht	Stadspartij Leefbaar Utrecht	Stadsbelang Utrecht

Vught		
2006	2010	2014
Gemeentebelangen Vught Samen Anders	Gemeentebelangen Vught Samen Anders (PvdA/GL)	Gemeentebelangen PvdA/GL

Zaltbommel		
2006	2010	2014
Zaltbommel Veranderen met Visie(Z.V.V.)	Z.V.V.	Z.V.V.

Appendix 8. The strength of leftist parties within local municipal councils (Average number for 2006, 2010 and 2014 electoral cycles).

Municipalities	The strength of leftist parties in municipal councils (%)	Municipalities	The strength of leftist parties in municipal councils (%)
1.Aalsmeer	47,61	21.Leeuwarden	56,69
2.Almere	57,27	22.Maastricht	54,7
3.Alphen aan de Rijn	46,52	23.Nederweert	15,69
4.Amersfoort	58,97	24.Nieuwegein	52,53
5.Amsterdam	77,78	25.Nijmegen	68,38
6.Apeldoorn	49,57	26.Purmerend	38,09
7.Breda	59,83	27.Rotterdam	51,11
8.Delft	61,26	28.Soest	45,98
9.Eindhoven	59,26	29.Staphorst	11,76
10.Enschede	54,7	30.Texel	55,55
11.Etten-Leur	39,51	31.Tilburg	57,21
12.Gouda	44,76	32.Utrecht	73,33
13.Gravenhage (Den Haag)	54,81	33.Venlo	34,84
14.Groningen	72,65	34.Vianen	23,53
15.Haarlem	70,94	35.Vught	68,25
16.Haarlemmermeer	47,86	36.Wageningen	62,67
17.Helmond	63,96	37.de Wolden	22,81
18.Hengelo	45,94	38.Zaanstad	52,99
19.Hertogenbosch	70,09	39.Zaltbommel	44,45
20.Kampen	26,33		