Labour market impacts of XL real estate

An analysis of the labour market benefits associated with the ‘Verdozing’ of the Netherlands

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1. Abstract

This research paper analyses the labour market effects as a result of an isolated and very large distribution centre locating to an area. These buildings are often opposed, based on arguments of aesthetics, blocking sightlines and that these buildings, due to their size, are often built in previously undeveloped areas. The counter argument to this point is that they provide employment for the local economy. This paper attempts to support this argument by analysing the local economy of several of the sites where an extra-large distribution centre was constructed. Focussing on the most high-impact of these buildings, those built away from similar constructions, the analysis compares their past employment levels with their more recent employment levels. This difference isthen compared with the average employment level growth in the Netherlands, and compared to reference areas with similar characteristics. The difference-in-differences analysis shows that the construction of an XL distribution centre in an area cannot be seen as a guarantee for employment growth in the local economy. Furthermore, regression analyses reveal that the location of such a building does not reveal higher levels of employment growth in the area. However, many of the XL distribution centres identified in this paper were no longer isolated by the year 2018, and had formed clusters of similar businesses, attracting new firms to the region.

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2. Introduction

A drive through any given part of the Netherlands shows that the views along the road and in the countryside are increasingly dominated by large, box shaped buildings. This phenomenon is called ‘Verdozing’. A quick search online shows many different websites that protest the phenomenon known as ‘Verdozing’. Several websites such as stopdeverdozing.nl protest this trend (stopdeverdozing.nl, 2020). This particular group attempts to stop the development of the Posthoren area, that would turn it into an industrial site that would primarily be used for distribution centres (stopdeverdozing.nl, 2020). The mission of the group entails stopping this planned development and ensuring that the ‘historically green character’ of the area is preserved (Ibid). The main development the group opposes is the construction of several ‘dozen’, or boxes.

The development of these boxes is in full swing in the Netherlands, and not only private groups such as #stopdeverdozing are voicing their concerns. A 2019 advisory paper by the College van Rijksadviseurs suggested that the current trend of large-scale construction of these boxes was unsustainable. Their judgement is in large part based on the rate at which new ‘boxes’ are constructed (College van Rijksadviseurs, 2019). One of the authors of the advisory paper, Berno Strootman, voiced more concerns and stated that the Netherlands loses 8 hectares of land to the development of boxes per day (Behne, 2019). The fast-paced development of these boxes is criticised due to unappealing nature of the box as an architectural design (College van Rijksadviseurs, 2019; stopdeverdozing.nl, 2020). In its own way, the box is the ultimate reduction in form of the building, that is nevertheless highly functional (College van Rijksadviseurs, 2019). The vast majority of the boxes, with very few exceptions, are used as distribution centres (Ibid).

The website of #stopdeverdozing shows that the group is not entirely opposed to development in the Posthoren area (stopdeverdozing.nl, 2020). Previous plans to create office space that kept the ‘green character’ of the area intact was actually supported by the group (Ibid). However, it is exactly the open green areas of the Netherlands that seem to attract these boxes, and especially the very large ones (Behne, 2019; College van Rijksadviseurs, 2019). The largest of these boxes are often too big to fit reasonably on existing business parks and industrial sites (Behne, 2019). These very large ‘boxes’ are part of the group of buildings labelled ‘(X)XL real estate’ (College van Rijksadviseurs, 2019). It seems that most of the fear

that people have regarding the construction of more box shaped distribution centres is targeted at the very large buildings (Altena & Kors, 2020).

2.1 Growing numbers

When looking at the dimensions of the average distribution centres and the number of distribution centres present in the Netherlands over time, there seems to be reason for concern (College van Rijksadviseurs, 2019). As figure 1 shows, the average box has been steadily increasing in surface area, while the total surface area of the Netherlands that is occupied by these buildings follows a similar pattern. The increased average size means they take up more space, vistas and most likely more previously undeveloped land (Ibid). The lifespan of a distribution centre is relatively long, as the simple design allows for cheap repairs (Sanjaya et al, 2019). These figures illustrate the core of the concerns voiced by those opposing the construction of more boxes: they are often built on previously undeveloped land and are increasing in number and size. On the other hand, there is virtually no opposition to buildings of this type being built on existing business parks, or in specific zones with a large number of existing distribution centres.

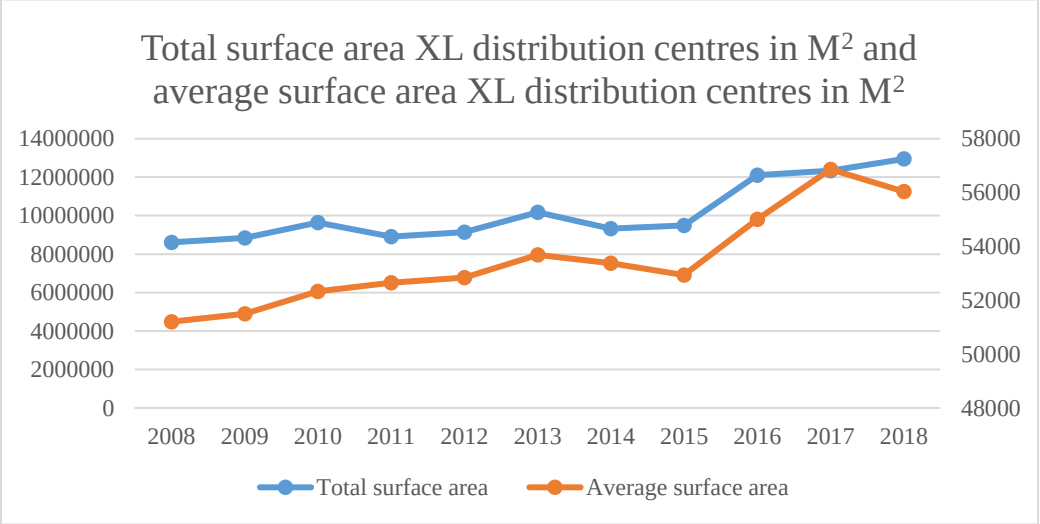


Figure 1: Total and Average surface area of XL distribution centres in ^{m2}, with the total numbers in the right-hand y axis, and the averages in the left-hand y axis (LISA, 2020).

2.2 Labour market implications

A dimension of the debate that is often brought up is the labour market outcome resulting from the construction of new boxes. For example, German retailer Zalando announced their plans to construct an XXL box shaped distribution centre in the town of Bleiswijk (Schelfaut, 2019). The main headline detailed not the size of the building, nor its unappealing aesthetics,

but rather stated that this new distribution centre would guarantee 1500 jobs (Schelfaut, 2019). This is especially interesting since Bleiswijk is a town with around 10,000 inhabitants, massively improving labour vacancies in the area. However, the true labour market impacts are often not supported with strong empirical data. Furthermore, it is often seen as beneficial for the local area and local economy, but is this really the spatial scope at which these effects take place?

2.3 The concerns and debate

With the supposed employment effects taking place at the local scale it is important to identify at which scale the negative aspects of the XL distribution centres arise. Box shaped distribution centres becoming larger and more widespread, and resistance to their construction will only continue to grow.. The vocal opposition is most concerned with the largest of these buildings, as they obstruct views to the greatest extent. This leads to the conclusion that the very largest distribution centres, placed on previously undeveloped land and away from others have the most negative impacts. When looking at the increasing number of distribution centres in the Netherlands, it would seem that the benefits outweigh the negatives, as there are more and more boxes each year. Yet, with the increasingly loud voices of those opposing their construction, perhaps reality is a bit more nuanced.

2.4 Negative impacts and positive outcomes

To attempt to get to the heart of comparing the negative impacts to the positive labour market benefits associated with the construction of a box shaped distribution centre certain choices have been made. The analysis will look at the box shaped distribution centres with the most negative impacts: the very largest distribution centres that are placed in areas that were previously undeveloped. This also ensures that the labour market implications are easy to observe, as there are no other large distribution centres in the area before the arrival of the box that is being investigated. In this way this paper will attempt to show how the labour market benefits of the location of a large box shaped building in a previously undeveloped area weigh up to the negative impacts of this box. The question that arises from this is thus: does an area in which a new XL distribution centre is built, see higher employment level growth than other areas in the country, with similar characteristics? This paper will compare areas in which XL distribution centres were built with areas in which there was no such construction, and follow these areas over time, to see if there is a greater level of employment growth in areas where an XL distribution centre was built.

3. Conceptual Framework

This chapter will attempt to provide a short overview of the subjects that have so far been covered in the literature regarding distribution centres and their labour market impacts. This chapter will discuss what existing literature explains about the necessity of distribution centres and their negative impacts. To answer the core questions regarding the labour market impacts of distribution centres, it is important to look at what the literature states in regards to the locations these distribution centres are located and how they can impact the labour market.

3.1 Negative impacts

As with any development, the construction of XL distribution centres has supporters and opposition. If XL distribution centres were purely drivers of employment levels, as the proponents of further construction argue, this would not be a controversial issue. However, there are several downsides to further construction of XL distribution centres, as pointed out by the opposition. While this paper is primarily concerned with investigating the claim of the supporters, that the construction of an XL distribution centre creates jobs on the local level, exclusively explaining the argument made by only one side in this debate could be seen as a bias, and influence the independence of this paper. Therefore, it is important to give an overview of the arguments made by the opposition.

Several downsides of an increased number of distribution centres in general are often presented by those that oppose the construction of more boxes: pollution from trucks and empty storefronts in cities (Chen & Wu, 2008; Pantano, 2018). However, these issues take place at a drastically different scale than the local scale this paper is attempting to analyse. Therefore, the discussion of the negative aspects of the XL distribution centre will be discussed with the same spatial scope in mind.

It is also worth noting that XL distribution centres have the effect of breaking up the landscape (College van Rijksadviseurs, 2019). Especially the distribution centres placed on former agricultural land, often surrounded by land that is still in use for agricultural purposes. This creates long stretches of agricultural land, suddenly interrupted by large box shaped buildings (Ibid). However, it should be noted that the limit of the negative impacts an XL distribution centre has on the landscape is the visible range. That is to say: the scale at which the negative impacts on the landscape, based on the shape, look and obstruction to the field of

view, is limited by how far one can see. In clusters of XL distribution centres, the breaking up of the landscape is less severe per building, whereas the impact is much higher for isolated distribution centres (Ibid). The visual scale, in the Netherlands, is much larger away from urban areas, as the lack of natural elevation creates long stretched out vistas. This means that, boxes built in this area have a greater negative impact on the landscape. Loner

Aside from the visual implications on the enjoyment of the Dutch landscape, an XL distribution centre takes up a large amount of space (College van Rijksadviseurs, 2019). This land can no longer be used for either agricultural purposes, nature or even for recreation (Ibid).

3.2 Labour market impacts

The development of a new XL distribution centre creates new vacancies that will need to be filled by workers. Any new XL distribution centre locating anywhere will have impacts on the local labour market (Benvegnù et al., 2008). Labour market impacts can be direct, indirect and induced. Direct labour market impacts are those that are directly employed by the new firm, the workers actually performing jobs at the physical location of the distribution centre (Ibid). The indirect labour market impact can be seen as those working for firms that now work for the XL distribution centres. Examples of these can be cleaners or administrative workers (Ibid). More difficult to identify are externalities and induced employment. Externalities are effects that befall third parties, and can be either positive or negative (Beaudry & Schiffauerova, 2008). They can be caused by agglomeration effects and can lead to business growth, and thereby to employment growth. Induced employment is the employment created by the consumption of those directly employed by the distribution centre and the indirect employees (Ibid).

Creating a conceptual framework of the possible labour market impacts described in the literature can give an overview of what can be expected in the analysis of the data. Having a baseline of effects that are likely to occur can help shape the analysis and identify these effects, and whether or not these changes in employment levels are direct, indirect or induced labour market impacts.

3.3 Direct labour market impact

The paper by the College van Rijksadviseurs (2019) estimates that XL distribution centres employ around 35 people per hectare of land. The average business park employs between 40 to 50 people per hectare of land (College van Rijksadviseurs, 2019). Furthermore, there are differences in the type of distribution centre that influence their labour market impact (Ibid). Firms specialising primarily in the transport and storage of goods averaged around 20 to 30 employees per hectare of land. On the other hand, firms specializing in e-commerce averaged between 60 to 80 employees per hectare of land (Ibid). The LISA dataset used in the analysis supported these numbers, for example: the XL distribution centre in the Vlaardingen area had 88 employees (LISA, 2020).

The largest of the e-commerce firms, with surface areas of more than 30.000 square metres, employ somewhere between 500 and 1000 workers. Smaller distribution centres, primarily concerned with transport and storage, only employ somewhere between 50 to 100 employees (College van Rijksadviseurs, 2019).

The construction of a distribution centre does not only directly impact its immediate surroundings, people are willing to commute for employment in the Netherlands (CBS, 2021b). The average home to work distance has remained relatively steady, at a distance of 22.7 kilometres in 2014 to a distance of 22.2 in 2019 (Ibid). The 2019 average commute in kilometres was slightly shorter in municipalities with a large number of LonerXL distribution centres: Aa en Hunze, Hollands kroon, Westerkwartier and Schagen, with a commute of 20,3, 14,9, 17,4 and 14,3 kilometres respectively (Ibid).

Taking the average travel distance as a buffer around a distribution centre to analyse employment effects is not an option. In 2014 there were 197 buildings that were categorised as XL distribution centres. Taking the average of 22,7 kilometres travel distance as a radius around each of these areas gives a research area of 4449,2 square kilometres. With the total surface area of the Netherlands being approximately 41543 square kilometres, this would mean that the research area is more than 10 percent of the surface of the entire country, while the employment in an XL distribution centre is much lower (CBS, 2021B), meaning this scale is not suitable for analysis. Identifying the effects on the labour market from such a small percentage of the total employment, as the employment in this sector is only a fraction of the total economy, on such a large spatial scale is not possible. Therefore, the employment effects

will need to be analysed at a smaller scale, on the local level. The local level can be seen in this context as a radius around the newly constructed distribution centre, capturing employment in this specific area. Furthermore, as the municipality is often responsible for zoning and granting permission for construction, the results from this analysis could be useful in policymaking, while an analysis taking place on a much larger spatial scale would be a less useful tool.

This creates an issue for the analysis of employment effects. Those that are employed in the selected area around an XL distribution centre might not be all that are employed at the distribution centre. Other employees might live far outside the local area and commute to the area to work. The employment effects caused by the location of the XL distribution centre in this area would therefore not be fully caught within a radius around the building. Furthermore, those that live within the radius and are employed by the new distribution centre might have already been employed elsewhere within the local area. In this case the new distribution centre would not necessarily attract new employment to an area as much as it would redistribute existing employment.

3.4 Indirect labour market impact

An XL distribution centre has a larger labour market impact than just its direct employees. Every business has effects on other businesses from other branches. Input output models can show which sectors are most affected by developments in the transport and storage sector (CBS, 2019). XL distribution centres fall within the Standard Business Classification (SBI) category of "Warehousing and support activities for transportation" (CBS, 2020). The total value of the sector in real prices is 25101 million euros (CBS, 2019; table 1). The sector has the most interactions with its own sector, and most margins are made on the export services of the sector. Furthermore, the output of the sector to the three different transport sectors, transport by land, air and water, amount to 349 million euros (Ibid). The fact that the sector most significantly interacts with itself means that the most indirect employment effects can also be found in this sector.

Most significant interactions on input-output tables (in millions of Euros)		
	Opslag, dienstverlening voor vervoer	
33	Grond-, water- en wegenbouw	436
41	Opslag, dienstverlening voor vervoer	4547

55	Exploitatie onroerend goed excl. eigen woningbezit	626
57	Holdings en managementadviesbureaus	524
64	Uitzendbureaus en arbeidsbemiddeling	929
84	Invoer diensten	2259
100	Totaal	25101

Table 1: most significant interactions on the input-output tables for the storage, services and transport sector

Fritsch and Noseleit (2013) show that increases in regional indirect employment can be expected when firms of a substantial size move to a new region. It is argued that indirect employment is always an inescapable result of new firms entering the regional labour market (Fritsch and Noseleit, 2013). Increases in indirect employment can simply be expected when a firm that requires third party services arrives in a region (Ibid). This means that it is to be expected to see increases in the indirect employment based on the arrival of an XL distribution centre to a new area.

A complication for analysing indirect labour market effects is the small scale at which the employment effects are analysed. For example, the sector shows 231 million euros in output going to the chemical industry, which most likely is not sourced locally (CBS, 2019). However, the spatial scale has been chosen for a reason, to analyse the issue at its most problematic scale. Due to the fact that most of the previously described negative aspects only affect the local area, this is a spatial scale closely around the XL distribution centre. This purposeful decision may cut off a part of the indirect employment effects from the analysis, due to the fact that they now take place outside of the research area. However, based on the literature, indirect employment effects are surely to be expected (Fritsch and Noseleit, 2013). These elements together would mean that while there will be observable indirect employment effects, many of them will not be observable in the analysis, due to the deliberate choice of focussing on local effects.

A further issue with analysing indirect employment effects is the fact that the input-output tables show a flow predominantly from the “Warehousing and support activities for transportation” to the same sector. This means that, strictly based on these tables, the majority of indirect employment effects expected to appear based on these cash flows are in the same

sector. This would mean that an analysis of indirect employment effects would be difficult, as the effects could be easily confused with direct employment effects.

The location of an XL Loner distribution centre could also attract new other businesses to the area. While some might be attracted here to provide services for the new distribution centre, some others might move due to the increase in general economic activity. This would mean that LonerXL distribution centres can thus theoretically act as flagship companies, drawing more economic activity to an area.

3.5 Externalities

Van der Panne (2004) states that the Netherlands is so concentrated that agglomeration externalities arise almost anywhere in the country. Externalities are extra value or costs created without the express purpose of doing so by any specific party. In this case, this can be additional value generated, or simply knowledge spillovers from one firm to another, which arise as a result of the Netherlands being highly concentrated.

Externalities have been described in great detail in the literature, and two main types can be identified: Marshallian and Jacobian externalities (Beaudry & Schiffauerova, 2008). The differences between these two are based on the level of similarity between the firms clustered together. If the firms clustered together are more similar in nature, Marshallian externalities can be expected, whereas if the firms are more different in nature, Jacobian externalities can be expected (Ibid).

Paci and Usai (2000) showed that even when dealing with very high-tech businesses, for example in the IT sector, knowledge and technology spill overs are not spatially unbounded and the effects decrease rapidly over time. That is to say, for firms to benefit from technology and knowledge spill overs they need to be clustered fairly close together, and the further they are away from one another, the weaker these externalities are (Paci & Usai, 2000). Based on this effect, and the fact that these isolated XL distribution centres are located away from the next business, which is similar in nature to the XL distribution centre; Jacobian externalities are the effects that can be expected. Jacobian externalities rely on the diversity of firms in a specific area (Beaudry & Schiffauerova, 2008). This means that the agglomeration effects are shared with firms located closely to the XL distribution centre, that are quite different in nature from the distribution centre. This would mean that externalities could provide

employment growth in both the direct employment of the distribution centre, the indirect employment and in induced employment from the consumption of the former two groups. In short: as a result of the location of the XL distribution centre locating in a specific area, employment level growth in all sectors as a result of externalities can be expected.

3.6 Induced employment

This second order effect of households consuming 193 million euros based on employment in this sector creates employment in other sectors. However, it is unclear how many jobs this would create. Exact numbers of jobs per million euros consumed do not exist. Induced employment effects are much smaller when new start-ups arrived in an area than when larger firms located to a region (Fritsch, 1997). The average job growth was mainly pushed by larger firms, where smaller start-ups needed time to grow and their effects were unobservable in the short run (Fritsch, 1997). De Souza (2002) showed that induced employment effects were more visible in greenfield developments than in brownfield developments. The arrival of an LonerXL distribution centre to an area can be seen as a greenfield development, since they are typically built on previous agricultural land, rather than on old industrial sites. New businesses starting up, and attracting labour, near a large greenfield development can be seen as an indicator of induced employment effects (De Souza, 2002). Vanhove (1981) showed similar findings in the tourism sector, where many new businesses appeared after a large hotel located in an area. This can also be seen as greenfield development, as areas previously not determined to be tourist attractions now boasted large hotels (Vanhove, 1981). This was shown to have effects on the labour market, not just in direct and indirect employment, but on the employment level as a whole.

The issue here is again that much of the induced employment effects may not be visible at the local level chosen for the analysis. This is due to the fact that households do not necessarily have to consume products within the small radius around the distribution centre, they may travel out of the bounds of the selected local area. This again means that not all of the induced employment effects may be caught within the local area that is the basis for the analysis, and thus most of it will be left out of the analysis. Furthermore, taking these small areas could ensure that the absolute number of people employed in this area is quite low, at which point the effects of their increased consumption might not show up at all, due to the effect being so small.

3.7 Observable impacts

Fritsch (1997) argues that many entrants to the market start small and fail to make a significant impact on the regional labour market. Only firms that have already been established can make noticeable impacts on employment levels (Fritsch, 1997). A firm like an XL distribution centre immediately needs a rather significant number of employees, which is expected increase employment at the local level. This will be tested by the analysis in the following chapters.

3.8 Why the boxes are needed

The main argument in favour of constructing more boxes, and the argument that has led to the existing supply of XXL real estate is the online economy. In the current system of online shopping a complex supply chain is required to service consumer demand (Mu et al., 2020). The consumption increases and the more complex the supply chain becomes; the more distribution centres are needed (Ibid). More and more products are purchased online and this trend is not expected to slow down any time soon (Sheth, 2020). Furthermore, the coronavirus pandemic is only expected to accelerate this trend of increased online shopping (Sheth, 2020). Consumer demand is driving the phenomenon of ‘verdozing’, and many of those speaking out against the phenomenon seem to be quite aware of this (Behne, 2019; Altena & Kors, 2020).

3.9 What are the characteristics of the site of an XL Distribution centre?

To find out the characteristics of the locations where the boxes are located, and the characteristics of the local labour markets, it is required to know why a distribution centre ends up in a specific location. The considerations and variables taken into account in the literature, can provide valuable insight into the characteristics of the locations of the XL distribution centres.

One of the core questions here is whether or not the possible success of an area is based on the location itself or the construction of a new distribution centre. That is to say, does an area succeed because of the large distribution centres, or are these distribution centres built in areas that were destined for success anyway?

Analysing how a specific location is chosen for a distribution centre also provides an overview of the shared characteristics for these areas.

Identifying the characteristics of the site where an XL distribution centre locates is important due to the fact that the immediate area around the chosen location is the subject of the analysis. Therefore, it is important to know whether these businesses chose sites based on specific characteristics that fit with the business model of an XL distribution centre, or if the businesses simply pick the area with the most potential in terms of labour market development and possible agglomeration.

A cursory search yields dozens of different models that analyse the perfect location for a distribution centre. Seemingly almost any spatial economic model has been applied to the phenomenon (Zhou et al., 2017). From mathematical models such as bi-level models (Saranwong & Likasiri, 2017) and gravity models (Sanjaya et al., 2019), to conceptual frameworks (Van Thai & Grewal, 2005) and uncertainty models (Zhou et al., 2017). This overload of options seems very complex, yet almost all of the models dealing with location choice for distribution centres take into account roughly the same inputs: distance to consumer markets, accessibility, land and building costs, agglomeration effects and availability of labour (Van Thai & Grewal, 2005; Saranwong and Likasiri, 2017; Zhou et al., 2017; Sanjaya et al., 2019; Ultaş et al., 2020).

3.9.1 Distance and Accessibility

Distance in models prescribing the best location for a distribution centre can be taken in two ways: distance from the consumer, or market, or the distance from the source of their products (Sanjaya et al., 2019; Zhou et al., 2017). Using the definitions of the different types of XL distribution centres in the Netherlands, it is to be assumed that firms wanting to locate either close to their sources or customers would not be situated in an area that was previously undeveloped, and thus has less economic activity (College van Rijksadviseurs, 2019). The main ports for imports in the Netherlands, the harbour of Rotterdam and Schiphol airport, have several XL distribution centres clustered together. Even smaller ports have clusters of distribution centres (Ibid). Following the theory of Hotelling, firms wanting to locate as close as possible to their consumers will cluster together (Hotelling, 1929). Firms wanting to locate close to their consumers also are likely to be part of a cluster, as all of the largest cities in the Netherlands contain at least one medium sized cluster (College van Rijksadviseurs, 2019; CBS, 2021a).

Accessibility refers to the location close to major infrastructure, that limits distribution costs (Sanjaya et al., 2019; Ulutaş et al., 2020). Where distance is primarily concerned with locating as close as possible to the suppliers or the market, accessibility is primarily concerned with suitable local infrastructure (Ulutas et al., 2020). These two factors are actually quite similar, and when viewed on a Webber triangle, distance would have a distribution centre located either closest to the supplier or the market, while prioritising accessibility would have the XL distribution centre located more towards the centre, at a location where transport costs would be the lowest (O'Brien & Shieh, 1989). Firms wanting to locate their distribution centres on locations that would benefit from these variables would locate along highways or on traffic junctions. While these areas may have been previously undeveloped when the first XL distribution centre arrived, they are often the host to several of these buildings, creating clusters or long strips of similar buildings along highways.

3.9.2 Agglomeration effects

Many distribution centres cluster together with the aim of profiting from possible agglomeration benefits (Ulutaş et al., 2020). Since the target of the analysis is XL distribution centres located in previously undeveloped areas, away from similar firms, this rules out agglomeration effects as the key variable for why these businesses locate in these areas.

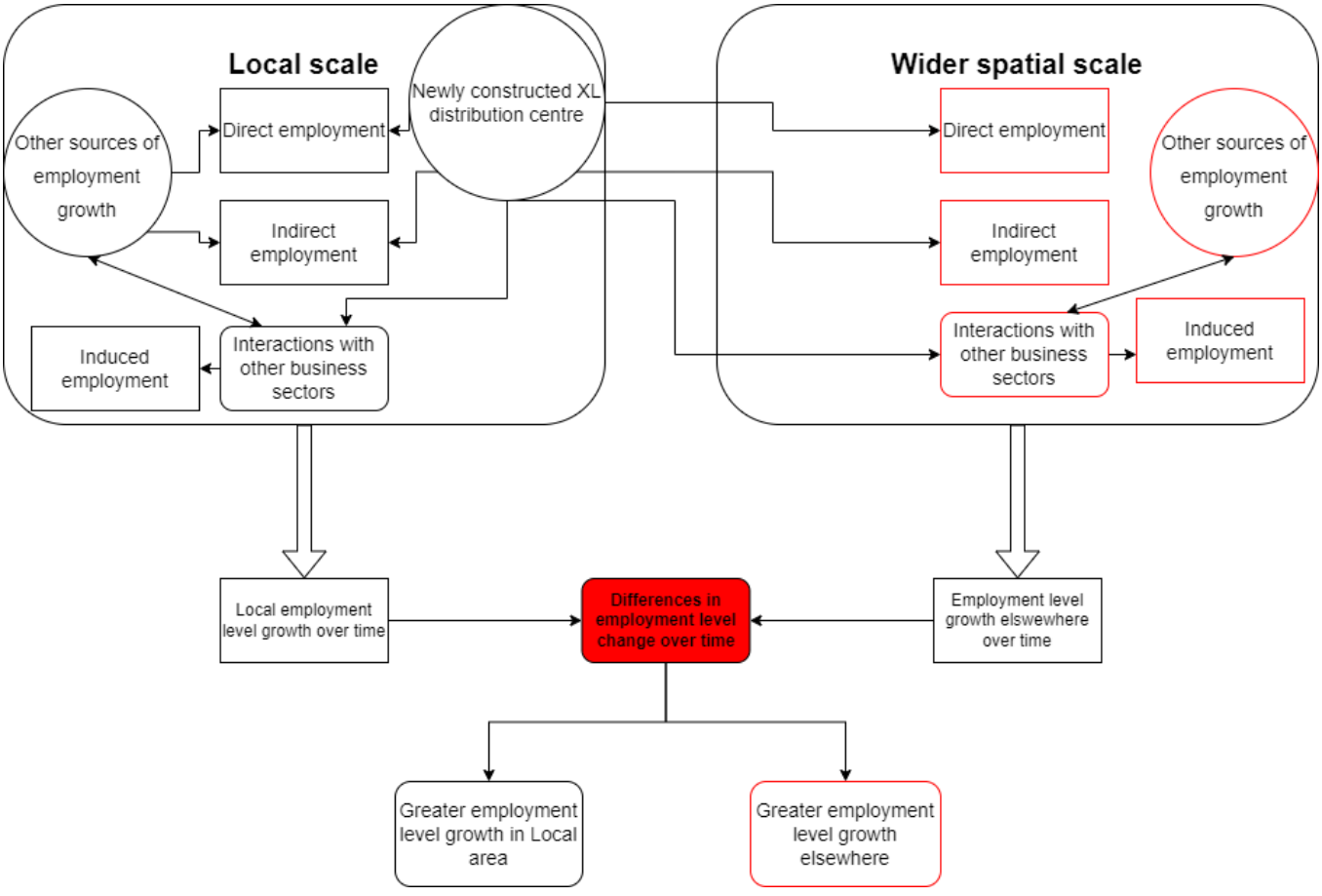
3.9.3 Land and building costs

Certain distribution centres can be located in areas where accessibility might be slightly lower, and the distances to suppliers and customers might be slightly higher, due to the fact that these extra costs are offset by much lower land costs (Sanjaya et al., 2019). Many of the problematic new XL distribution centres are built on former agricultural land (College van Rijksadviseurs, 2019). Agricultural land, in the Netherlands, is much cheaper than other types of land (NVM, 2021). Land prices on business parks are also higher than the prices of former agricultural land (Botec, 2020). The year 2020 saw record high prices for agricultural land at around €6,40 per square metre, which is still much lower than the average price of land in an industrial park, at an average of €55,- in Friesland, the province with the lowest prices for land in industrial parks (Botec, 2020; NVM, 2021). It can be theorized that a distribution centre located on former agricultural land, away from other distribution centres partially based their location decision on land costs.

3.9.4 Labour availability

A final element found in almost all models regarding location choice for a distribution centre is the availability of labour at a local level (Zhou et al., 2017). Labour is needed to fulfil the demands of the consumers and suppliers of an XL distribution centre. Locations can be chosen based on the fact that labour is abundantly available here, for example in cities (Sanjaya et al., 2019). However, a firm in a city has considerable competition on its demand for labour, by other firms (Ibid). This competition increases wages in the high-density areas with high demand and high supply for labour (Bouri & van Ours, 2013). Locating in an area with low competition on the demand for labour can reduce wages, making it more attractive for a firm to locate here (Bouri & van Ours, 2013). A firm that makes the decision to locate in an area away from other XL distribution centres might be motivated by lower wage levels and high availability of labour. Furthermore, it can be theorized that labour availability in a location has been analysed before the choice for the location has been made, indicating that there is sufficient labour available where a firm has located.

3.10 Conceptual model



The conceptual model outlines the two key spatial scales at which the problem is analysed: the local scale, which is negatively affected by the XL distribution centre, and the wider spatial scale. The model shows that, while a percentage of the employment level growth is likely to affect the local level, some employment growth may fall outside of these parametres. his is due to the previously mentioned commuting distances. This means that some of the people that are now employed at the newly constructed XL distribution centre may live outside of the local area. Furthermore, the conceptual model accounts for the fact that there are many other sources of employment, both within the local area and outside the local area. These sources of employment growth are split up in direct employment, indirect employment and induced employment, with the induced employment having been generated as a result of interactions. This creates two spatial scales with the difference between them that the XL distribution centre is located in the local area. The conceptual model further shows the objective of this paper: analysing the possible employment level growth in the local area as a result of an XL distribution centre locating in this area.

3.11 Hypotheses

With these differing characteristics in mind, it seems that the XL distribution centres that are located in previously undeveloped areas, are located here most likely due to low land costs and high availability of labour. If the location was chosen primarily based on the availability of labour, the distribution centre would show up in the analysis as a reduction in unemployment. Based on these assumptions, an area where an XL distribution centre is located, where there was previously no building of the type, would see an increase in employment over a period of time. However, the fact that some of these effects may take place outside the local area selected for the analysis may cause some of these effects to not be visible.

- The first hypothesis of this paper is: There is a positive effect on the number of people employed in the local economy after the arrival of an XL distribution centre.
- The second hypothesis is: there is a greater increase in employment levels over time in areas where an XL distribution centre was located than in similar areas where no distribution centre was located.
- The third hypothesis is: the arrival of an XL distribution centre in an area is the source of the employment level growth observed on the local level.

Methods

The required tool for the analysis is a dataset which has both the number of workers within the year of arrival of an Loner XL distribution centre and the number of workers in the years 2017 and 2018 to use in a difference-in-difference analysis. Furthermore, these datasets will require the SBI codes of these working people in order to pinpoint the impacts in specific sectors. In order to generate these datasets, certain steps have to be taken to ensure that the data is correct and workable. This section describes how this dataset was generated.

4.1 Identifying the problematic boxes

The most impactful XL distribution centres are those that are built in previously undeveloped areas. These are seen by both the authors of the paper by the College van Rijksadviseurs (2019) and the opposition to XL distribution centres as the most harmful. These buildings are constructed in areas that often had a green character before, where no real construction had previously taken place. Due to their size, they are hard to place elsewhere, however there are several examples from the Netherlands where these buildings are built in specific areas close together, often in business parks. It is important to filter out these most impactful buildings, as they are the subject of the analysis. Taking into account the fact that many opposed to the construction of more boxes find them unsightly and that they block their view, the largest of these buildings are naturally the most impactful, and thus the most suitable for analysis.

The advisory paper by the College van Rijksadviseurs (2019) labels every building over 20.000 square metres as being XL real estate, and every building over 50.000 square metres as XXL real estate. Within the groups of XL and XXL real estate three groups of buildings can be distinguished: boxes (mostly distribution centres at this size), greenhouses and other very large structures such as airports and train stations (College van Rijksadviseurs, 2019).

The advisory paper by the College van Rijksadviseurs (2019) identifies four different types of box construction projects: Large clusters, Middle-sized clusters, ‘Strips’ and ‘Loners’.

There are currently 11 large clusters of XXL boxes in the Netherlands, and the boxes within these clusters are deemed as the ‘least problematic’ (College van Rijksadviseurs, 2019). The very high concentration of box shaped distribution centres mean that this specific area already

has the character of a business park or industrial zone. This means that the clustering of large numbers of boxes is actually reducing the problem; less vistas and nature areas are affected as these sites are concentrated (Ibid). The large-scale clustering of the majority of the distribution centres is seen as the preferable outcome by the advisory paper of the College van Rijksadviseurs (2019).

Middle-sized clusters are slightly smaller than large clusters, but more numerous (College van Rijksadviseurs, 2019). The concentration of several boxes allows for close cooperation between the firms, creating agglomeration effects and spill overs, but at a lower level than in large clusters. These clusters can be surrounded by woods and foliage to limit the impact on the surrounding nature and its vistas (Ibid).

The strip type of 'verdozing' shows large numbers of distribution centres along highways and rail networks (College van Rijksadvisuers, 2019). These cause the vistas from the highway to be disrupted, and many people experience the Dutch landscape from the highway (College van Rijksadviseurs, 2019; Behne, 2019). The strip type of 'verdozing' is seen as 'problematic', due to its impact on the landscape, limited ability to cooperate between the different firms (thus limiting potential agglomeration effects) and limited ability to hide the buildings using nature (College van Rijksadviseurs, 2019).

The most problematic type of box construction, according to the paper, is the 'Loner' type (College van Rijksadviseurs, 2019). These types of box shaped distribution centres are at least 20.000 square metres and are the only building of their type and size within a 5-kilometre radius (Ibid). Building individual boxes means that there are no possibilities for agglomeration effects, and a maximal impact on the landscape per square metre of built structure (Ibid). The Loner type is also what is referred to when people complain about boxes being put down without too much thought (Pen, 2019). There are currently 62 lone boxes in the Netherlands, of which 14 are larger than 30.000 square metres (College van Rijksadviseurs, 2019).

This paper chooses to analyse the Loner type XL distribution centres due to the fact that these specific types of XL distribution centres show most clearly the negative impacts XL distribution centres can have. Therefore, these types of XL distribution centres would need to

clearly show the positive effects an XL distribution centre can have, in order to offset the negatives.

4.2 Scale

The radius around the LLoner type XL distribution centres used to capture employment effects is 2.2 kilometres. This is the visual scale, the distance at which one can still see the building.Loner. The majority of arguments against further construction of XL distribution centres deal with sightlines and aesthetics of the building. The problems therefore arise at the scale at which one can actually see the building. Analysing the issue on the level where most problems arise is the most logical choice. This could provide insights on an administrative level, as using the same spatial scale for the benefits (employment growth) as the negatives (aesthetic impacts), creates a concise way of weighing the costs and benefits of the construction of new Loner type XL distribution centres.

A 2011 paper by Meeuwsen and Jochem uses the model 'Viewscape'. The Viewscape model clearly shows that the main limitations to the visual range of a human standing on flat ground are forests and the built environment (Meeuwsen & Jochem, 2011). The 360-degree view one has from a specific location is primarily limited by these two factors, and the most common limiting factor to the visible are tree rows (Ibid). Depending on the location of the observation, urban areas and rural areas can yield different results when looking at the most common obstruction for the field of view (Ibid). The results from the 'Viewscape' model show stark differences in different areas in the Netherlands regarding to the number of hectares one can view from a specific location, ranging from less than one hectare of observable land to more than 1000 hectares of observable land (Ibid) (Figure 3).

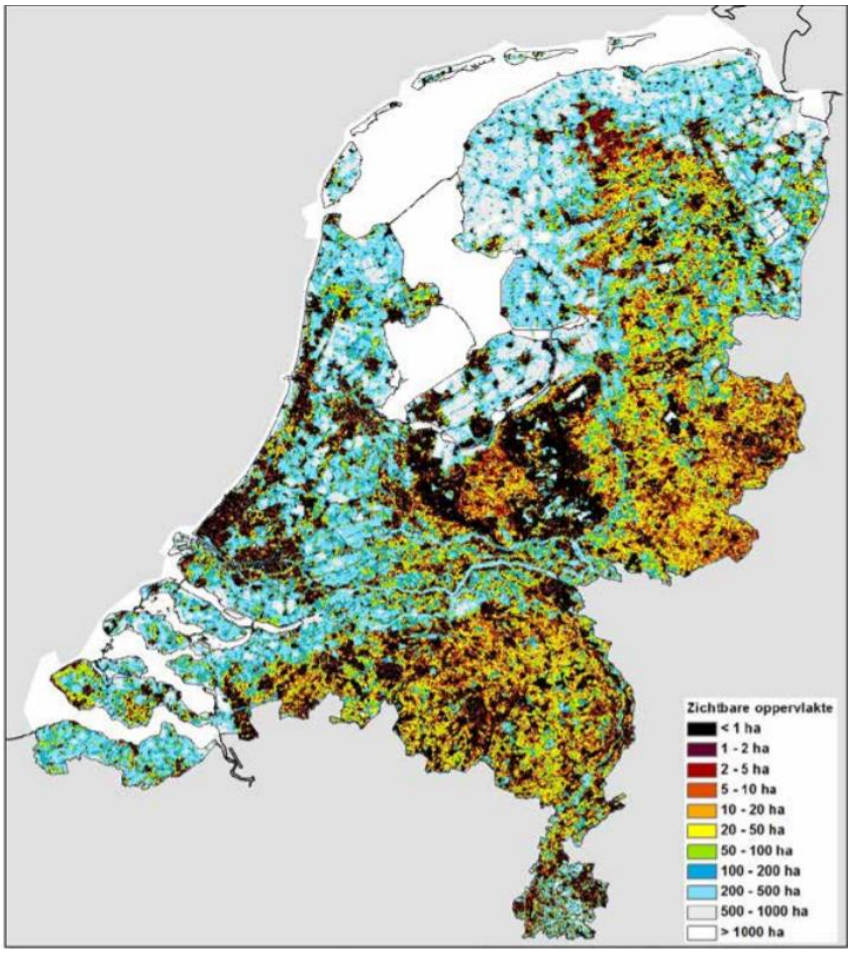


Figure 3: The maximum observable number of hectares in the Netherlands depending on location (Meeuwsen & Jochem, 2011).

The maximum radius around a person standing on flat ground that can be observed without any obstructions is 2200 metres, giving a total observable surface of 1521 hectares of land (Meeuwsen and Jochem, 2011). The maximum visual scale is therefore 2200 metres, indicating that there are several areas within the 5000-metre radius around a LLoner type XL distribution centre, the radius that signifies the building as a Loner, within which the building cannot be observed. Using this scale, the issue gets analysed at its most problematic level, while still analysing the local economy.

The desired outcome of the work in Arcmap is therefore a series of layers within a map that showed the locations of all LLoner type XL distribution centres, and to create a radius of 2.2 kilometres around them to capture the employment within this area.

Figure 4: The locations of Loner type XL distribution centres in 2008 (Author, 2021)

While this provides a strong argument for using a buffer with a diametre of 2200 metres, other scales need to be taken into consideration as well. The first alternative buffer that warrants an argument is the 5000-metre alternative. This is the distance at which XL distribution centres have to be located away from each other to be classified as LLoners. The use of this buffer is primarily supported by College van Rijksadviseurs (2019). This paper is the origin of the classifications for Loners, clusters and strips, classifications which are extensively used in this paper. Setting a buffer at 5000 metres creates the largest possible buffer around the individual buildings wherein there is a guarantee of not finding another Loner type XL distribution centre. Therefore, this is the largest possible spatial scale at which the employment effects can

be analysed that ensures no distortion of the labour market effects as a result of another Loner type XL distribution centre being present inside the buffer, making it worthwhile to take this buffer size into consideration.

The second buffer size that has to be taken into consideration is a 10000-metre buffer. This is due to the fact that this buffer size roughly approximates the size of an average municipality in the Netherlands. Since many of the arguments made by the opposition to the construction of more XL distribution centres target policy made by municipalities it becomes an interesting dimension to analyse (Behne, 2019; stopdeverdozing.nl, 2020).

4.3 Data

For the analysis, Loner type XL distribution centres are based on the system of the Standaard Bedrijfsindeling (SBI). The SBI codes can identify specific sectors in which businesses operate. The codes selected to capture the Loner type XL distribution centres are 52101, 52102, 52109, 5221, 52241, 52242 and 52291. The second element used for isolating the Loner type XL distribution centres is surface area. Using Basisregistratie Adressen en Gebouwen, BAG in short, buildings within the selected SBI codes can be filtered out based on surface area. The required surface area to classify as an XL distribution centre is 20.000m^2.

Labour market information was supplied by the LISA dataset which includes the number of jobs per postal code, and the sector in which these people work. This dataset ran for ten years, from 2008 through 2018. The dataset has 9.821.185 rows, providing information for each of the four variables. However, due to the nature of the main hypothesis, the data will need to be analysed over a period of time, and thus the dataset was split up into ten individual datasets, for the years 2008 through 2018 respectively (Table 2). These treatments were performed in the software SPSS Statistics 26 (IBM Corp., 2019). Both of these datasets were added to the map, creating the locations for the Loners, the polygons around them to create buffers, and the point data from the LISA dataset was added to the map based on postal code, so it could be captured within the buffers. The data split up along the lines of years was used for the difference-in-difference analysis. The dataset for the regressions uses a different system. In this dataset, the year in which the XL distribution centre arrived in the area is used as an identifier, with the years since the arrival of the building and the years before the arrival of the building being used as separate variables.

Year	Number of jobs
2008	8056522
2009	8103419
2010	8174293
2011	8248956
2012	8231881
2013	8150731
2014	8095757
2015	8131451
2016	8241510
2017	8370374
2018	8480397

Table 2: overview of LISA datasets per year, showing the increase in employment in the Netherlands in absolute numbers (LISA, 2020).

4.4 Buffers

As the analysis takes place at the local level, at a distance of 2200 metres around the distribution centre, it is essential to find a way to identify employment levels within this specific area. Using the 'buffer' tool, polygons of 2200 metres were created in a radius around the Loner type XL distribution centres (Figure 5). The LISA data was added to the map based on the six-digit level of the postal code (for example: 1234 AB). The 'intersect' tool captures the employment within the buffer. This created the desired table to use for the analysis: an overview of employment levels per Loner type XL distribution centre. These steps were then repeated to create datasets for each of the years in which a Loner type XL distribution centre was built, creating the possibility of tracking the employment effects over time.
Furthermore, an analysis based on buffers of five and ten kilometres will also be performed. These scales can be surmised as the following:

- 2.2 Kilometres: the scale at which the negative impacts of the building can most clearly be observed.
- 5 Kilometres: the scale at which XL distribution centres are characterised as Loner types, if there are no other XL distribution centres within the radius.
- 10 Kilometres: an approximation of the size of a municipality in the Netherlands.

Based on the literature, these larger buffers should show lower rates of employment increase (Paci and Ucai, 2000). Employment effects and especially any agglomeration effects that occur as a result of the location of a Loner type XL distribution centre in an area should

reduce rapidly over distance (Ibid). The expectation is that the effects on employment within the 5 kilometre and the 10-kilometre buffer would be more similar to the employment growth in the country as a whole. Furthermore, while the 5-kilometre buffer would guarantee no other Loner type XL distribution centres being present in the buffer, the 10-kilomtre buffer would not.

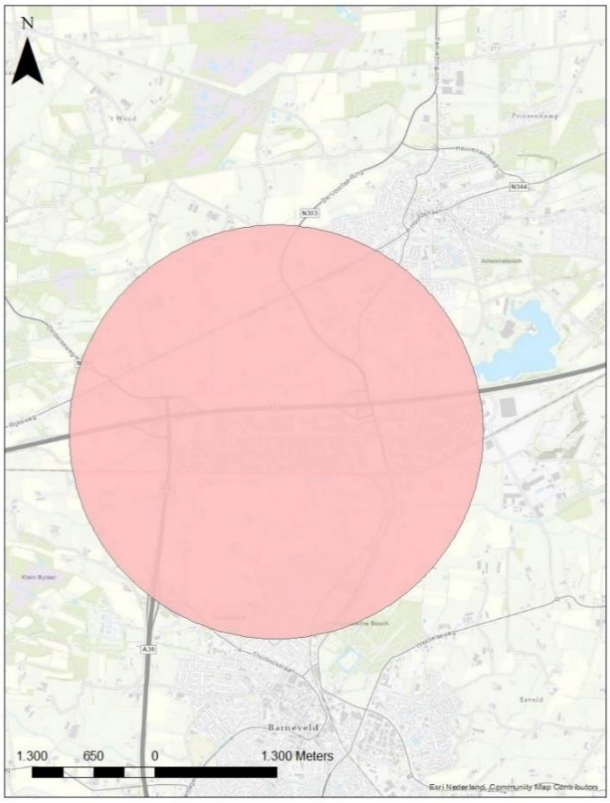


Figure 5: Example of a Loner type XL distribution centre and the radius around it, this one located near Barneveld.

4.5 Descriptive statistics

The descriptive statistics taken from the eventual selection of XL distribution centres and Loner type XL distribution centres shows that while the absolute number of XL distribution centres is steadily increasing, the number of Loner types fluctuates over the year (Table 3). Furthermore, the percentage off boxes that are Loners is decreasing (Ibid). This would imply further clustering. On the one hand this would appease the opponents of distribution centres, fewer new buildings are being built on previously undeveloped land, and existing buildings are becoming clusters. However, on the other hand this could imply Loner type XL distribution centres functioning as flagship businesses, arriving in previously undeveloped areas and over time bringing more and more similar businesses with them. This would be a

problem to those opposing new construction. However, this idea relies on the fact that the arrival of the first Loner type XL distribution centre would make the area more attractive for other businesses. One of the factors that would make the area more attractive, based on the factors influencing location choice, would be the employment level. Since the change in employment level will be visible in a difference-in-differences analysis, the analysis is needed to answer this question. The idea of the Loner type XL distribution centre as a flagship can be analysed using the regression models. A positive employment level change with a negative coefficient for the effect of the location of the XL distribution centre would imply that the employment level growth came from other sources. These other sources would in this case be externalities, drivers of employment growth in the area originating in the time between the location of the Loner type XL distribution centre in the area and the final year of observation.

Year	**Total XL boxes**	**Loner type XL boxes**	**Percentage of total XL boxes**
2008	152	38	25%
2009	150	36	24%
2010	166	38	22,89156%
2011	159	38	23,89937%
2012	176	40	22,72727%
2013	185	36	19,45946%
2014	187	41	21,92513%
2015	197	45	22,84264%
2016	201	47	23,38308%
2017	216	46	21,2963%
2018	230	42	18,26087%

Table 3: Total stock of XL boxes and Loner type XL boxes between 2008 and 2018 (Author, 2021).

The analysis shows that the decrease in the number of Loner type XL distribution centres, relative to the total number of XL distribution centres was caused in large part due to the clustering together of multiple XL distribution centres, causing these buildings to lose their classification as Loners (LISA, 2020). The former Loner type XL distribution centres that have lost their classification will not be taken into account in the analysis, as they no longer fit the subject of the analysis.

4.6 Difference-in-differences

The analysis of the labour market effects was performed using a difference-in-differences analysis. The difference-in-difference analysis compares an area where a Loner type XL distribution centre located, starting from the year in which the distribution centre arrived in the area, to an area with similar starting conditions where no distribution centre was constructed.

The choice for using a difference-in-differences analysis was based on two factors. In the case of this paper there is a clear separation of before and after the event. The time before the event, the location of a Loner type XL distribution in a specific area, is ‘Before’, and tracking that area over a period of time gives an ‘After’. Secondly, using a difference-in-differences analysis allows for comparisons between one area over time, and another area over time. One area where the event took place, and another area where the event did not take place. This helps answer the questions regarding the possible labour market impacts of the location of a distribution centre over time. The difference-in-differences model allows for testing of the area in which a distribution centre settled with an area where it did not, and compare their labour market outcomes. This is the core target of the analysis, and thus the difference-in-differences approach is highly suitable.

The difference-in difference analysis uses the mean of the employment in the years 2017 and 2018 as final year in the analysis. This choice was made due to the fact that in one particular year, anomalies may be observable due to shocks to the economy. These can be of many different natures, such as material shortages or policy decisions. Therefore, combining two years is assumed to lessen the effects of these shocks on the system.
The data generated 26 different areas of analysis. These areas will from now on be referred to as research areas. Due to the deliberate choice to combine the years 2017 and 2018 as the final year of the analysis, two of these areas had to be dropped from the analysis, due to the

distribution centres in this dataset being built in the year 2017. Furthermore, the year 2008 was also dropped from the analysis. The areas from the 2008 dataset would add another 38 research areas to the analysis. However, due to the fact that it is not known if these 38 sites were opened in the year 2008 or if they were opened before 2008, they were dropped from the analysis.
Loner.

4.7 Difference-in-differences models

Model 1

In the first difference-in-difference model, the research areas are compared with the national average. In this way, the employment level change of the research areas is compared with the employment level change in the rest of the country. This model aims to analyse whether employment level growth in the research areas is above the national average.

On one side of the model, the research areas are placed. These are created using the output from Arcmap to create buffers within which the LISA employment data is captured. For the first model a 2.2-kilometre buffer is used. For tables 4,5 and 6 a 2.2-kilometre, a 5-kilometre and a 10-kilometre buffer are used respectively. In these difference in difference models, only the years 2009 and 2018 are used for the research areas. The analysis uses the annual averages of the employment levels in the years 2009 and 2018 to create a variable that shows the average employment level growth between these two years for all of the research areas. The first model however does not use annual averages. This model uses each year separately. That is to say, each research area is identified based on the year in which a Loner type XL distribution centre located here. Each research area is then combined with the employment level for the year 2018 for that specific area to create a variable that shows employment growth over time for that specific research area.

On the other side of the model, the areas in which no Loner type XL distribution centre had been constructed can be found. In the case of difference-in-differences model 1, this is the rest of the country. The employment data was once again taken from the LISA dataset, in this case by simply not using any filter to capture employment for specific areas, and filtering out data per year. For tables 4,5 and 6, only the years 2008 and 2018 were used, while in model 1 the years 2009 to 2018 were used.

Model 2

Difference-in-differences model 2 analyses whether the research areas showed greater employment level growth than areas that were similar in nature but did not house a Loner type XL distribution centre.

On the side of the research areas, the second difference-in-differences model has the same inputs as model 1: yearly data based on the year of arrival of the Loner type XL distribution centre captured in a 2.2-kilometre radius. This creates a variable for employment level change between the year of arrival and the year 2018.

On the other side of difference-in-difference model 2 is municipal employment data based on the CBS 2022 database. This decision for this dataset was based on two factors. Firstly, the population numbers in municipalities tended to be similar to the numbers in the research areas. For example: the first area in the difference-in-difference analysis is an area near Barneveld. The total of working people in the Barneveld research area in 2009 was 2867, while the reference area was the municipality of Bloemendaal, with a working population of 1910 in 2009. The second reason for this data type as a reference group was the availability of data on specific employment sectors. Since the analysis focusses on employment factors, and most specifically those within a certain sector, this is a useful tool for selecting the most suitable reference area. Matching the reference area to the research area based on a similar percentage of people working in the primary sector for transport and distribution in the starting year provides areas that are suitable for comparison. With a minimum number of 380 municipalities to choose from, matching reference areas to the research areas based on the percentage of workers in this sector became precise.

The data uses the 2018 municipal units. This was needed due to the fact that between 2018 and 2022, the year in which the analysis was performed, municipal boundaries had changed and some municipalities had ceased to exist. However, the available employment data in the LISA dataset ran from 2008 to 2018.

Model 3

Model 3 measures the employment level growth of all research areas from a specific year against all reference areas for a specific year. This is done to account for outliers on either side of the model, that skew the results.

On the research side, the inputs are annual averages of the research areas. That is to say, all research areas where a Loner type XL distribution centre located a specific year were combined. This was done by taking the averages of the first difference, the difference between the starting year and the year 2018.

On the reference side, the same municipal employment data from the CBS 2022 database used in model 2 was used. The data on the starting years and the year 2018 is combined to create annual averages. The annual average of the starting year and the annual average of the year 2018 are combined to create the first difference.

The two differences, the difference for both the annual averages of the research areas and the reference areas between the starting years and the year 2018, are used to calculate the difference-in-differences. In this case, this means the difference in the differences between the annual averages of the starting years for the research and reference groups, and the annual average for the year 2018.

4.8 Regression

An in-depth analysis will be performed using a linear regression. This regression is used to answer two questions: firstly, are the areas in which the Loner type XL distribution centres are built underperforming areas, which could explain possible results of the difference-in-differences analysis if the growth rate in the research areas is below the national average. Secondly, which other variables have a large impact on the differences in employment growth across regions.

The first regression will be performed on the municipal level. This is due to the fact that differences between the municipalities in which the Loner type XL distribution centres were located and the rest of the country had been observed in a previous DID analysis on a 10-kilometre radius, comparable to the size of a Dutch municipality (Figure 6). The second reason for this is that many policy decisions in the Netherlands are made at the municipal level. Therefore, if the increased growth in employment from the location of a Loner type XL distribution centre can be proven, policy decisions can be made regarding this information. These decisions then are made at the municipal level, showing the usefulness of an analysis at this spatial scale.

A second regression will be performed using municipal data as well as the buffers at 2.2 kilometres. These buffers give the most precise information on the scale at which the problem is most impactful. Therefore, this spatial scale warrants analysis.

The covariates chosen for the analysis were: population density based on the workforce, since this can vary heavily between municipalities, the percentage of total working age people being employed, which can explain differences between municipalities in terms of activation of the workforce and finally the percentage of people employed in the sector trade and storage, since this is the sector in which XL distribution centres operate, high percentages of the workforce being employed in this sector could imply higher influence of the firms on the local labour market.

4. Results

Five different analyses have been performed, of which three are difference-in-differences analyses. One difference-in-differences analysis between the research areas and the Netherlands as a whole, one difference-in-differences analysis between the research areas and their respective reference areas and one with the combination of the research and reference areas per year. The first analysis is used to answer the first hypothesis of this paper: There is a positive effect on the number of people employed in the local economy after the arrival of an XL distribution centre. This analysis will show if there is a uniformly greater growth in employment levels in areas where a distribution centre located, compared to the average of the country in that time period. The hypothesis will hold if all research areas show above average levels of growth in their employment levels. If some show lower levels of employment growth than the country average, this means that the location of an XL distribution centre in an area is no guarantee for economic growth. While this hypothesis could be answered in a more simplistic manner, using the difference-in-differences model would allow the second hypothesis to also be answered with the results of the same analyses.

The second analysis compares the research areas to similar areas located elsewhere in the Netherlands. Here, the analysis tests the second hypothesis: there is a greater increase in employment levels over time in areas where an XL distribution centre was located than in similar areas where no distribution centre was located. This hypothesis will similarly hold if the research areas show greater employment level growth than the reference areas. This would imply that the location of the XL distribution centre was the deciding factor in the success of the area. If the research areas do not show greater increases of employment growth, this would mean the hypothesis should be rejected.

The third analysis combines the different research areas per year with the reference areas per year, in order to create a clearer picture and reduce the effect of outliers. This will show emerging patterns per year, and reinforce the outcomes of analysis 1 and 2 regarding the first hypothesis.

Two regression analyses will be performed. One on the municipal level, comparing the municipalities in which a Loner type XL distribution centre was located to those that did not have this event occur. The second analysis will compare the research areas to the

municipalities in the Netherlands, to analyse whether these areas showed greater employment growth due to the location of a Loner type XL distribution centre in the area. These two analyses will be used to answer the third hypothesis; the arrival of an XL distribution centre in an area is the source of the employment level growth observed on the local level.
If the variable for the arrival of the Loner type XL distribution centre in the area is significant and de coefficient is positive in both models, the hypothesis holds, otherwise it is rejected. Furthermore, there will be a time sensitive variable for the years under treatment, meaning the years since the arrival of the Loner type XL distribution centre in the area. If this is also significant with a positive coefficient, this means that the third hypothesis can be assumed correct, and the arrival of a Loner type XL distribution centre in an area is a driver of employment level growth over time.

5.1 Scales and general analysis

The first set of Loner type XL distribution centres used to select the size of the buffer was the firms that were classified as Loner type XL distribution centres in 2008, and still had this classification in 2018. As mentioned before, many firms from 2008 were no longer part of the dataset in 2018, as they were no longer further than 5 kilometres away from the next distribution centre. This left a dataset of 11 firms, out of the 38 firms that were classified as Loner type XL distribution centres in 2008.

The first buffer tested was the 2200 metres, based on visual range. This produced a difference-in-differences percentage of 1,17% (Table 4). Repeating the same analysis with buffers of five kilometres gave a percentage of -5.72 (Table 5). Repeating the same analysis with buffers of 10 kilometres gave a percentage of -12.76 (Table 6). In both of the alternative buffers growth rates were lower than in the rest of the country. In the 10-kilometre buffer there was no growth at all, and employment decreased with 3.63%.

Years	**Employment within area with XL Distribution centre**	**Employment in the Netherlands as a whole**
2008	57780	7845184

2018	63731	8561446
Difference	10.30%	9,13%
Difference in Differences	1,17%	

Table 4: Difference-in-Differences based on a 2.2-kilometre radius (Author, 2021).

Years	**LISA Employment within area with XL Distribution centre**	**LISA Employment in the Netherlands as a whole**
2008	81915	7845184
2018	84711	8561446
Difference	3.41%	9,13%
Difference-in-Differences	-5.72%	

Table 5: Difference-in-differences based on a 5-kilometre buffer.

Years	**LISA Employment within area with XL Distribution centre**	**LISA Employment in the Netherlands as a whole**
2008	166840	7845184
2018	160782	8561446
Difference	-3.63%	9,13%
Difference-in-Differences	-12.76%	

Table 6: Difference-in-differences based on a 10-kilometre buffer.

Tables 4, 5 and 6 show effects are most visible on the smallest scale. This can be interpreted in two distinct ways. The first interpretation is that the employment effects of the location of a Loner type XL distribution centre in a specific area happen at a very small spatial scale. That is to say, most of the effects are happening close to the building itself. If this is to be the case, this effect will be visible in the difference-in-difference and regression models. This

interpretation would support the hypotheses of this paper. The second way in which this can be interpreted is that these wider areas as a whole are underperforming in terms of employment growth, when compared to the rest of the country. These underperforming areas would be expected to have surpluses of labour, due to these potential employees not being able to find work in an underperforming area (Ultaş et al., 2020). This pattern across the large number of Loner type XL distribution centres from 2008, would imply that Loner type XL distribution centres pick underperforming areas as the location for their building.

5.2 Discontinued Loner type XL distribution centres and new clusters

In the dataset, it quickly becomes clear that several locations that were previously classified as a Loner type XL distribution centre have lost this classification. This can be due to three different reasons. The first is that the business is simply defunct and no longer operated in a way that would qualify it to be an XL distribution centre. This was the case for only a very small number of the XL distribution centres that left the dataset between 2008 and 2018. The second reason that this might occur is due to the business itself moving to a different location, that falls within a 5-kilometre radius of another XL distribution centre. This accounted for several of the Loner type XL distribution centres that left the dataset. They moved to areas that where they formed clusters with other XL distribution centres. The third reason for a business no longer being classified as a Loner type XL distribution centre was due to the arrival of a new XL distribution centre within the 5-kilometre radius. Figure 6 shows the locations of distribution centres that were no longer classified as Loner type XL distribution centres by 2018.

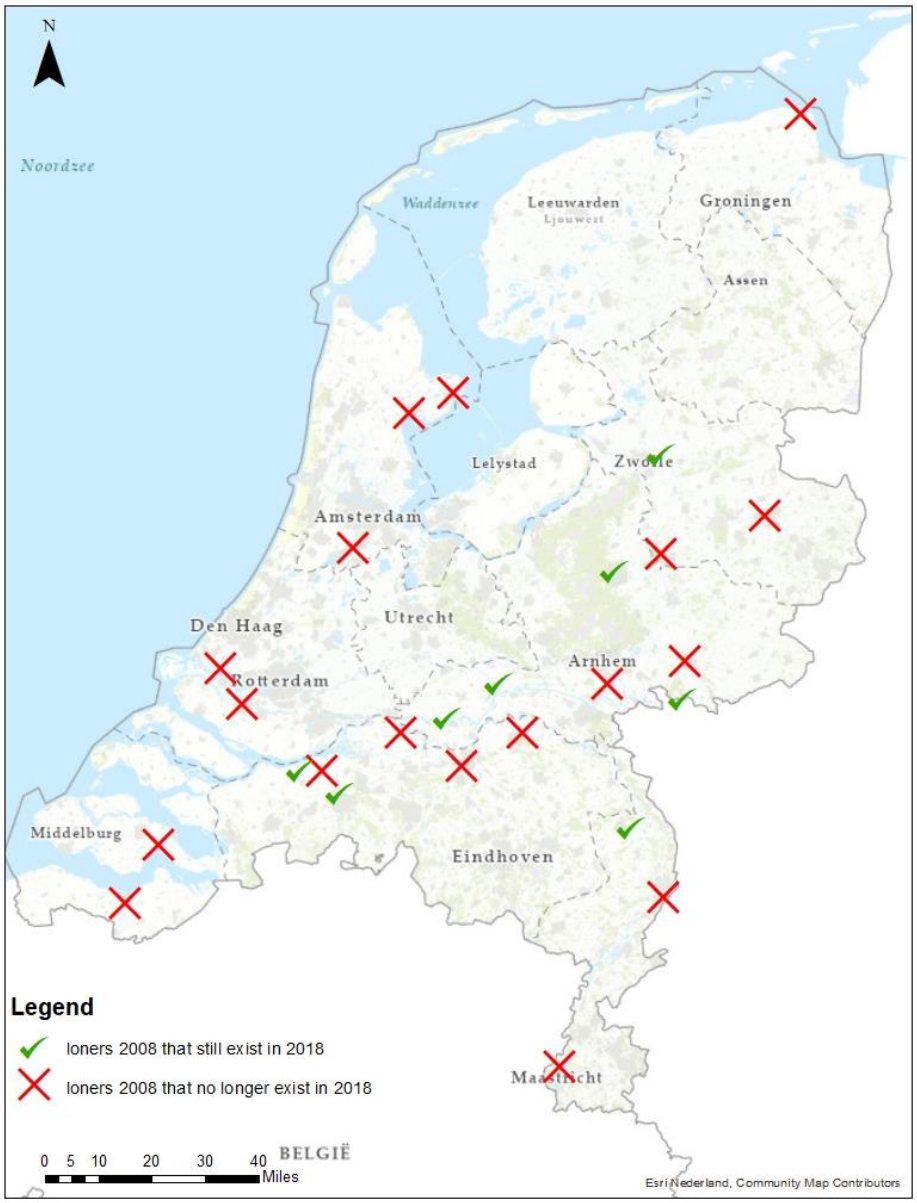


Figure 6: Loner type XL DC's from 2008 that still existed in 2018 and became clusters and those that left the Loner type classification for other reasons (Author, 2021).

The majority of Loner type XL distribution centres from 2008 that had left the dataset by 2018 left for the first two reasons mentioned, dissolution of the business location or moving the operation to a clustered location. Figure 6 shows a number of Loners from the 2008 dataset. None of these still held the classification of "Loner" in the year 2018. Those in green still existed in the year 2018, while those in red had left the dataset. However, those in green were no longer classified as Loners, due to becoming part of a cluster, due to having at least one new XL distribution centre within the 5-kilometre radius. However, several of those in

red had actually moved to another location, some of them becoming new Loners in subsequent years.

The fact that quite a large number of Loner type XL distribution centres became clusters, suggests that these areas were deemed suitable locations by more firms than just the owners of the original distribution centre (Figure 7). The creation of these clusters may be in part due to policy, as College van Rijksadviseurs (2019) suggests should be done in the entire country.

However, a part of this could also have been possibly explained by agglomeration effects and indirect employment effects. The original Loner type XL distribution centre could have acted as a flagship firm, being the first to locate in an area while others followed later. This however is outside the scope of this paper and will be featured in the discussion chapter of this paper, as this paper is not primarily concerned with XL distribution centre clusters or the ability of a Loner type XL distribution centre to function as a flagship firm that attracts other XL distribution centres to an area.

Figure 7: New clusters that appeared between 2008 and 2018.

An interesting observation with the new clusters that formed as a result of the location of new XL distribution centres within the 5-kilomtres radius of previously established XL distribution centres is that several clusters are relatively compact. This supports the theory that these new clusters tend to form around available amenities that were previously used by only one XL distribution centre. This can give credence to the claim that around XL distribution centres, certain businesses will locate to provide specific services to the XL distribution centre, creating indirect employment effects. This also brings an interesting dimension to the earlier question of whether the locations were chosen based on a set of variables and characteristics that were best suited to the firm, or if they were chosen due to the fact that they were going to succeed anyway. These locations have attracted multiple businesses, and therefore can be seen as having been successful to a certain degree. This could mean that these sites were well chosen, they experienced some development and more and more firms established themselves in this area.

The first impact this has on the analysis is that it decreases the number of available sites for analysis. Only the Loner type XL distribution centres are taken into consideration for the analysis and the much smaller number of available sites in 2018 decreases the ‘N’ in the difference-in-differences analysis as well as in the regression.

The second impact is that the indirect and induced employment effects can be less effectively analysed using the previously mentioned methods. Taking into account that the observations in which this effect is most likely to be observable have left the dataset, this means an analysis of the indirect and induced employment effects will be omitted from this paper.

5.3 Difference-in-differences

The results of the difference-in-differences analysis show that the percentage wise difference in employment between the areas within the 2.2-kilometre radius of a new Loner type XL distribution centre and the rest of the country differs (Table 5). However, it should be noted that this difference is non-homogenous in direction; as such certain years show a positive difference while others show a negative difference. Furthermore, some years show a lower percentage wise change than the control group, the rest of the country.

Difference-in-differences	Reference areas and Netherlands			
2009				
Barneveld area	Vlissingen area			
-0,1134	**-15,924**			
2010				
Benningbroek area	Vlaardingen area	Waalwijk area	Heteren area	
-30,064	**-8,6477**	**18,0113**	**4,46511**	
2011				
Almere area	Kesteren area			
-14,338	**-4,5154**			
2012				
Drongelen area	Groenlo area			
-3,3864	**27,1169**			
2013				
Sprang-Capelle area	Beltrum area			
32,6041	**8,57609**			
2014				
Maasdijk area	Maassluis area	Den Bosch area	Maasbracht area	Duiven area
12,8467	**18,7082**	**9,1942**	**9,99847**	**-7,2538**
2015				
Beek area	Enschede area	Kampen area	Nieuwe Pekela area	
13,5855	**-10,997**	**12,0318**	**8,53352**	
2016				
Leiden area	Breda area	Deurningen area		
-0,6249	**-8,8417**	**9,47531**		
2017				
Lelystad area	Nijmegen area			
6,40331	**4,7649**			

Table 5: results of the difference-in-differences analysis between the individual research areas and the Netherlands, with the results of the difference-in-differences in bold text.

The bold numbers in table 5 represent the difference-in-differences between that area and the Netherlands, between the year in which they were added and the mean of the years 2017/2018. The year 2017 has been added to the table, but is only compared to the year 2018. The lack of uniformity in the analysis shows that these areas can observe both greater and smaller growth in employment levels than the national average. Certain areas, such as the Groenlo area saw much greater increases in employment level than the country average. Others, such as the Vlissingen area, saw a decrease in employment levels. As table 9

(appendix) shows, throughout the years the employment growth rates in the Netherlands as a whole remained relatively consistent. The lowest difference between the starting year and the mean of 2017 and 2018 was roughly 2.6 percent, from 2011, while the highest difference was roughly 4.7 percent, from 2009 (Table 9). On the other hand, the differing research areas provided vastly differing employment growth levels. On the one hand, the Benningbroek area saw a negative difference of almost thirty percent, indicating a large decrease in employment in the area. On the other hand, the Groenlo area saw a positive difference of almost thirty percent, showing large increases in employment levels in this area.

Table 5 shows that the construction of a Loner type XL distribution centre in a specific area does not guarantee greater employment level growth than the national average. Furthermore, this analysis shows that the construction of a Loner type XL distribution centre does not guarantee economic growth on the local level at all, as several of the research areas showed negative employment growth (Table 5).

However, to truly find out whether or not these areas showed anything special in terms of economic growth they would need to be compared to similar areas without any XL distribution centres. That analysis is showed in the following table (Table 6).

Difference-in-differences	Research areas and Reference areas		
2009			
Barneveld area	Vlissingen area		
-63,834	**-68,126**		
2010			
Benningbroek area	Vlaardingen area	Waalwijk area	Heteren area
-65,045	**-58,021**	**17,9108**	**1,27415**
2011			
Almere area	Kesteren area		
-54,722	**-34,628**		
2012			
Drongelen area	Groenlo area		
-40,245	**9,70668**		
2013			
Sprang-Capelle area	Beltrum area		
12,9416	**-31,976**		
2014			

Maasdijk area	Maassluis area	Den Bosch area	Maasbracht area	Duiven area
-37,376	**-0,7309**	**-16,062**	**10,4327**	**-29,811**
2015				
Beek area	Enschede area	Kampen area	Nieuwe Pekela area	
17,1136	**-11,485**	**9,00205**	**8,73795**	
2016				
Leiden area	Breda area	Deurningen area		
-2,5217	**-11,726**	**7,76921**		

Table 6: results of the difference-in-differences analysis of the research areas with their reference areas.

Table 6 gives an overview of the difference-in-differences percentages between the research areas and the reference areas, in this case municipalities selected based on similarities with the research area. The results again show a lack of uniformity, revealing both positive and negative differences-in-differences. In contrast to the analysis using the Netherlands as a whole, the results are more extreme, showing much greater negatives. This is due to the fact that the reference areas differ far more in employment level changes (Table 8, appendix). With the lowest difference being about half a percent, and the highest nearly seventy percent, this made the differences between the research areas and reference areas a starker contrast (Table 8). The research areas were matched to reference areas based on the percentage of the working population in each area that is employed in the sector "Vervoer en Opslag", the sector where primary employment effects will take place.

2009			
Barneveld area	Vlissingen area		
0,348797	**1,073926**		
2010			
Benningbroek area	Vlaardingen area	Waalwijk area	Heteren area
0,937012	**1,167264**	**6,76623**	**2,09546**
2011			
Almere area	Kesteren area		
1,077821	**1,374705**		
2012			
Drongelen area	Groenlo area		
1,195652	**1,325301**		
2013			
Sprang-Capelle area	Beltrum area		
1,111497	**0,995438**		
2014			

Maasdijk area	Maassluis area	Den Bosch area	Maasbracht area	Duiven area
1,044386	**1,209373**	**0,813164**	**3,268846**	**1,340782**
2015				
Beek area	Enschede area	Kampen area	Nieuwe Pekela area	
65,94626	**0,344931**	**1,181335**	**4,728132**	
2016				
Leiden area	Breda area	Deurningen area		
1,612277	**1,486014**	**1,067553**		

Table 7: percentage of all workers that are employed in the sector "Vervoer en Opslag".

Comparing the data in table 7 to that in table 6, an interesting pattern in the data can be observed. Those areas with a larger percentage of their population being employed in the sector "Vervoer en Opslag" have greater increases in employment levels than those with smaller percentages employed in this sector. For example: the Beek area has the highest percentage of people being employed in this sector, at almost 66 percent (Table 7). The analysis shows that this area has a large positive difference-in-difference. On the other hand, the Barneveld area has the smallest percentage of people working in this sector, and a heavily negative result in the difference-in-difference.

Difference-in-differences	Combined research areas and Netherlands			
2009	2010	2011	2012	2013
-65,98%	**-25,97%**	**-44,68%**	**-15,27%**	**-9,52%**
2014	2015	2016	2017	
-14,71%	**5,84%**	**-2,16%**	**4,17%**	

Table 8: averaged difference-in-difference results per year.

The combined difference-in-difference analysis shows another interesting pattern emerging: the difference-in-differences between the research areas and the reference areas is much larger in the earlier years. While the years 2015 and 2017 show positive numbers, showing that the research areas showed, on average, greater levels of employment growth, the years 2009 and 2011 showed much larger negative numbers. This means that in these years, the employment level in the research areas, on average, grew at a much slower pace when compared to the reference areas, or even decreased.

5.4 Regression

Two regressions have been performed in order to test the significance of the effect that the location of a Loner type XL distribution centre has on the employment level change in a specific area. The regression analysis was chosen based on its ability to account for covariates and the differences in the populations of the reference areas and municipalities. The first regression was based on the municipal level, analysing the difference in employment level change between municipalities in which a Loner type XL distribution centre had located and those where no such firm was located. This regression included the covariates employment per square kilometre, the net labour participation and the direct employment in the sector. This model will from now on be referred to as model 1.

Table 9 shows that the model was indeed significant and was able to explain roughly 20 percent of the variance observed in the model. Table 9 also show the results of this regression. All variables except the years with treatment, the constant and the net labour participation are significant at the 5% level. This shows that the effect of treatment is in fact significant, as well as the level of employment growth per year after treatment has taken place. In this model, the treatment is the location of a Loner type distribution centre to the municipality. Years with refers to the number of years between the treatment and the year 2018 and Delta with treatment per year is the employment level change per year for each year after the treatment has taken place. The dependent variable in the model is the employment level change; the difference in the employment level between the starting year, 2008, and the final year, 2018. In this model, the independent variables relating to the arrival of the Loner type XL distribution centre and the added covariates are used to explain the difference in employment level change between the different cases in the analysis.

Regression

Model 1	Adjusted R Square	0,202		
		Coefficients	t	Sig.
	ANOVA			0
	(Constant)		-1,849	0,065
	Employment per km2	0,435	9,014	0
	Net labour participation	0,092	1,927	0,055
	Direct employment in sector	-0,108	-2,237	0,026

Delta with treatment per year	0,182	2,604	0,01
Treatment	-0,271	-1,985	0,048
Years with	0,2	1,746	0,082

Table 9: regression output for model 1

The regression of model 1 shows a trend that follows the results of the difference-in-difference analyses, the coefficient of treatment is negative. This means that, with the employment level change being the dependent variable, treatment in general has a negative effect on employment growth in an area. On the other hand, the fact that 'Years with' is not significant means that the time between the Treatment and the year 2018 does not have a significant impact on the employment level change. Delta with treatment per year has a positive coefficient, however this was to be expected, as greater employment growth per year would lead to greater total employment level change. Furthermore, it is also important to note that direct employment in sector, while statistically significant, has a negative coefficient. This would mean that the greater the relative number of people in the area working in this sector, the lower the level of employment growth.

The second regression was performed on all of the municipalities in the Netherlands, as well as on the 2.2-kilometre radius around the Loner type XL distribution centres. This analysis looks at the employment level change at the problem scale, as outlined in section 5.1. In this regression the same covariates have been included as in model 1, however the net labour participation has been omitted due to issues with collinearity and the fact that it was not significant in model 1. This model will be referred to as model 2.

The dependent variable in the model is again the employment level change; the difference in the employment level between the starting year, 2008, and the final year, 2018. In this model, the independent variables relating to the arrival of the Loner type XL distribution centre and the added covariates are used to explain the difference in employment level change between the different cases in the analysis.

Table 10 shows that model 2 is also significant and explains roughly 17 percent of the observed variance. Table 10 also shows the results of the regression. The regression for model 2 shows highly differing results from model 1. Here all variables except Employment per km2 are not significant. Only employment per km2 reveals a significant change in the employment

level change, and has a positive coefficient. This means that higher employment per km2 is the only thing in this model that significantly explains the differing employment level change between different areas.

Regression				
Model 2	Adjusted R Square	0,172		
		Coefficients	t	Sig.
	ANOVA			0
	(Constant)		-0,88	0,38
	Employment per km2	0,428	9,037	0
	Direct employment in sector	-0,033	-0,689	0,491
	Delta with treatment per year	0,034	0,591	0,555
	Treatment	0,017	0,137	0,891
	years with	-0,014	-0,129	0,898

Table 10: regression output for model 2

5. Discussion

The following chapter will deal with the discussion of the research design, the results and the elements omitted from the analysis. Furthermore, it will give advice on areas of interest this paper has not analysed and suggestions for future research.

6.1 Research design

The setup of the analysis focusses heavily on a specific type of XL distribution centre, the 'LLoner type'. While this specific type was chosen due to the fact that it fits best with the subject matter at the core of the analysis, it leaves out the majority of XL distribution centres that do not fit this classification. The LLoner type XL distribution centre was chosen due to the fact that it was more suited to identify the effect that one of these buildings would have on its surrounding area, but this does not imply that, for example, strip type XL distribution centres do not have an impact on the employment in the local area.

While the justifications for the choices made in the setup of the research design have been discussed in previous chapters, it is nonetheless of note to state that other aspects of the placement and impact of this placement of XL distribution centres have impacts on the local employment level. Each of these firms and the respective buildings would logically impact local employment, as well as create indirect and induced employment. However, due to the choice to focus on the LLoner type, due to the fact that this type was most heavily criticised in the public discourse only this type was analysed.

The limiting factor on which LLoner type distribution centres were taken into account was based on the surface area of the building itself. The lower limit of these buildings was a surface of at least 20.000 square metres, with no upper limit. This meant that a large number of distribution centres were left out of the analysis. However, that does not mean that these smaller LLoner type distribution centres could not potentially have the same negative impacts on the lives of locals.

Furthermore, due to the different types of goods stored and transported to and from the different distribution centres in the Netherlands, the actual employment between them varies

due to the differences in the possible level of automatization per firm. This means that some distribution centres that are slightly smaller than the lower limit of 20.000 square metres may potentially have much higher direct employment than some much larger distribution centres, with higher levels of automatization.

The focus on the employment effects on the local level for exclusively the LLoner type XL distribution centres left out the dimension of the clusters. The formation of clusters over time was observed by tracking the 2008 dataset. This was an interesting observation as clusters were formed around the majority of firms that were Loner type XL distribution centres in 2008. The clustering of former Loner types in to XL distribution centre clusters can be seen as an important mechanism through which these types of buildings impact the local economy. As mentioned previously, the clustering of XL distribution centres together could indicate that this is a result of indirect employment effects. This dimension is not explored in the analysis of this paper.

Further research into this subject could primarily focus on the formation of such clusters, as they can be seen as the primary recipient of indirect labour market effects as a result of the location of the first XL distribution centre.

Further research with a more precise focus on the specific business of a firm with an XL distribution centre, or another type of large distribution centre could be useful in providing several answers to questions not answered in this research paper. First off, differences in direct and indirect employment based on which product moves through the distribution centre or which sector the firm behind the distribution centre is part of, could be identified. Secondly, it could give a clearer indication as to how much the size of a distribution centre influences its employment effects. These two indicators could then be useful in policymaking, as they could help select the distribution centres with the most positive effects for possible LLoner placements, while clustering those with fewer positive effects.

A matter to be addressed in the research setup is the choice for the country on which the analysis was done: the Netherlands. When compared to many other countries, the Netherlands stand boasts a very high population density. This has negative effects on the interpretation of the research findings. While Loner type XL distribution centres show to have a positive impact on the local employment level, the most observable effect, the effect on the direct employment, becomes obscured. This is due to the fact that there are simply far more workers likely to live within the radius of the Loner type XL distribution centre, compared to

other countries. In this paper the direct employment effects of a Loner type XL distribution centre were sometimes less than 0.1 percent of the total employment in the local area. Furthermore, the percentagewise increase in employment due to direct employment at the new Loner type XL distribution centre was sometimes much smaller than the total increase in employment in the area. This would, in a future analysis of the subject require more precise data regarding the relationship between employee and employer; where do the people that work for this firm live. With this information the analysis would be less generalised and could be more targeted towards specific firms, rather than on a set spatial scale.

For future research it might be interesting to repeat the analysis of this paper in another country with similar infrastructure development but a lower population density, for example a Nordic country. These countries have well developed infrastructure, similar to the Netherlands, but much lower population density. In this hypothetical situation, the effects of a Loner type XL distribution centre on the employment level growth in the local area would be much easier to identify.

Another point that warrants discussion is the use of the SBI codes to identify XL distribution centres. The SBI codes chosen dealt with sectors such as storage, transport and distribution. In one case, despite the specific codes having been carefully chosen, a structure still had to be omitted from the analysis. This building was a large parking garage for bicycles, that was identified using SBI codes as storage and transport. Other buildings such as this one did not appear in the analysis and therefore this building was deemed to be misclassified in the SBI registration. However, this case of a false positive in the dataset could imply that there were also false negatives, buildings that could likely be an XL distribution centre that were left out of the analysis due to a different classification. Due to the fact that the SBI codes are rigid and updated annually the odds of this happening are rather slim, and the paper uses the assumption that the SBI codes are correct when it comes to identifying the nature of the use of the building.

The 2.2-kilometre radius was based on the visual scale in the Netherlands, due to the fact that most criticism of building more XL distribution centres were based on visual problems, such as aesthetics and sightlines. This means that there is a very weak economical basis for this scale. It is not based on the distance people commute to work, meaning it is most likely not capable of fully catching employment generated by the building. Firms attempting to profit from the establishment of a LLoner type XL distribution centre tend to locate close by. Cleaning services, for example, will have the benefits of reduced transport costs when

locating closer to the firm that employs their services. However, based on theories such as Hotelling (1929) they will locate in between the firms they service, which is likely not within the 2.2-kilometre radius, meaning that induced employment cannot be captured on this spatial scale.

Furthermore, due to the fact that this radius is smaller than the five-kilometre radius that extends around the LLoner type XL distribution centres, overlap becomes impossible. In this way other XL distribution centres employment effects cannot interfere with the subject of the analysis. It also corrects better for the high population density in the Netherlands. While in the five- or ten-kilometre radius direct employment effects have the problem of the effects getting obscured by other possible sources of employment effects, the two-kilometre radius avoids this problem by focussing on a smaller area, and thus has fewer other sources of employment effects that distort the results.

6.2 Elements omitted from the analysis

The analysis only briefly deals with induced employment effects. This is due to the fact that these effects, and the specific sectors in which they occur are difficult to pinpoint. That is to say, identifying new employment in sectors that could have occurred as a result of the arrival of a LLoner type XL distribution centre is difficult. Using input-output tables for the distribution and storage sector, which sectors are most directly linked to this sector, based on the flow of revenue, were identified. However, this only helps to identify indirect effects in the employment level. Induced effects are far harder to narrow down and are much more susceptible to speculation. For example, while the new arrival of a LLoner type XL distribution centre might encourage its employees to shop for groceries in the local area, it is simply a matter of correlation, rather than causation that employment in the retail sector would rise. Therefore, it becomes highly complicated to make any sort of factual statements based on this information. Furthermore, over a timespan that is at the very least one year, since the duration between the establishment of a LLoner type XL distribution centre and the final year of employment data varies, it is very likely that more effects occur in the local economy than just the establishment of the LLoner type XL distribution centre. Since the direct employment in these areas by the XL distribution centres was often only around one to two percent, it becomes exceedingly hard to identify what these small numbers of people added to the labour market by their consumption alone. An added issue on the analysis of

induced employment effects is the small number of people in certain research areas. For example, the Heteren research area only has a population of 859 employed people in 2010. Combining the small percentage of these employed people that are actually employed by the local XL distribution centre with the small number of total employees in this area leads to the conclusion that induced employment effects would be very hard to observe. Even harder than observing these effects would be linking them to the arrival of the Loner type XL distribution centre. This leaves the induced employment effects in a grey area, compared to the direct and indirect employment effects.

Further research into the induced employment effects regarding the establishment of either LLoner type XL distribution centres or any of the other types. While identifying the induced employment for LLoner type XL distribution centres might be the most interesting to supplement the findings of this paper, an analysis regarding any of the types of XL distribution centres could fill the gap in the literature regarding these effects. While research is available regarding induced employment effects in several sectors, it seems to be lacking on this specific subject. Therefore, any insights into this phenomenon could be helpful.

Another point that warrants discussion regarding omitted elements is the exclusion of the financial sector in terms of indirect and induced employment. In the Netherlands, like many other countries, the financial sector tends to be highly clustered. These clusters are quite a distance away from the locations of the LLoner type XL distribution centres and thus do not count as local labour market effects. However, by looking at the input output tables, one can see substantial interactions between the two sectors. This would imply that there is growth, either indirect or induced, in the labour market in the financial sector, as a result of the establishment of more LLoner type XL distribution centres. Future research could focus on exploring how much the establishment of more and more XL distribution centres generates employment in the financial sector. Additionally, this could concern other sectors. As the input-output table summary in table 1 shows, there are several business sectors with strong interactions with the direct employment sector. Further research could take several of these into account.

Further research into induced and indirect employment effects on the local level, brought on by the construction of XL distribution centres, should probably not focus on Loner types. As this paper has shown, Loner types generate induced employment effects that are almost unobservable on the local level, and their main indirect employment effect is clustering, ensuring that this firm is no longer a LLoner. These clusters would be a far more suitable

subject for analysis when it comes to these two employment effects. The larger area of the cluster, the 5-kilometre radius in which they gather can be used as the area selected for analysis (Figure 6). Within this larger area induced employment effects will be more visible. On the other hand, following these firms over time, starting with the arrival of the first Loner type in the area, can be valuable data for analysing how the first XL distribution could act as a flagship for others. This is important to answer the questions created by figure 7 and the rest of paragraph 5.2. Whether or the first Loner type XL distribution centre functions as a flagship firm was not the topic of this paper. This dimension is therefore not explored in detail in the analysis. However, it creates several interesting new questions: is the clustering of firms together really a result of indirect employment effects? Can these effects be observed in an analysis on these clusters? Answering these questions could lead to useful insights regarding the indirect employment effects as a result of the construction on XL distribution centres.

6.3 Important points regarding the analysis

The following paragraph will deal with the discussion of the results of the difference-in-differences analyses and the results of the two regression models. Furthermore, this paragraph will point out several details in the discussion regarding the general topic of this paper that warrant discussion.

A point that needs to be addressed when discussing the findings of this paper is the reason for the existence of the XL distribution centres in the first place. Namely that they are implied to be an induced demand. That is to say, they only exist due to the rising consumption of goods that are stored and transported from these locations. The availability of goods to order from a distribution centre leads to more consumption of these goods, which leads to the creation of more XL distribution centres, which in turn creates a larger abundance of goods available to order from an XL distribution centre. In this way, there is a circular pattern that will ensure the construction of an ever-increasing number of XL distribution centres. For this paper however, this supposed continuing pattern is not necessary to explore. The main points regarding the construction of new XL distribution centres are based on where they are built, rather than why they are built. Since the main negative points regarding XL distribution centres discussed in this paper, the buildings being an eyesore and they block sightlines, are based on the location of the building, rather than the quantity of buildings of this type.

Therefore, to limit the length of the entire paper, the reason why these buildings were built in the first place is left out of the analysis.

It should be pointed out that from the perspective where most of the criticisms on the XL distribution centres come from, aesthetics and blocking of views, clustering may not necessarily as much of a good thing as is implied in the advisory paper (X)XL verdozing - Minder, compacter, geconcentreerder, multifunctioneler by the College van Rijksadviseurs (2019). Most of this paper works under the assumption of this paper that clusters of XL distribution centres are better than LLoner type XL distribution centres. They use this assumption based on their position that the arrival of more and more XL distribution centres is inevitable, and better placement of the buildings to limit spatial impacts is the only option. This position is not shared by many of the critics of the XL distribution centres, who argue that simply not building them at all is the better solution. These people will therefore not welcome clustering as readily, as it will simply increase the number of XL distribution centres.

6.4 Discussion regarding the results of the analysis

The difference-in-difference analyses all reached the same general conclusion: there is no guarantee for employment growth by the location of a Loner type XL distribution centre in an area. The differing areas showed vastly different results in terms of difference-in-differences when compared to the country as a whole and when compared to reference areas. Furthermore, combining the research and reference areas to give a result that is less susceptible to outliers also resulted in no uniformity along the differing years. Both positive and negative differences-in-differences were observed. What is interesting in this case is the fact that the difference seems to be much higher when looking at years longer ago, on average. This would mean that, over time, the construction of an XL distribution centre is a net negative in terms of employment level change for a region. This lack of uniformity regarding the data meant that no real conclusions could be drawn, aside from the interesting pattern that emerged. This necessitated more statistical testing, in this case in two different regression models.

The regression models showed highly different results. In the first model, most variables showed significance and, especially interesting given the topic of this paper, the variable for treatment was significant. This meant that the location of the Loner type XL distribution

centre in the area had a significant impact on the level of employment growth. However, this variable proved to have a negative coefficient. This could not confirm the theory posited above, that over time the location of a Loner type XL distribution centre was a negative to the area, due to the fact that the variable for the number of years the since the treatment was negative. This did point out that, contrary to the hypothesis of this paper, the location of a Loner type XL distribution centre in an area was no guarantee for employment level growth. Paragraph 5.1 discusses underperforming regions on a municipal level. The theory is that these firms pick underperforming municipalities to locate in due to the variables outlined in paragraph 3.9: availability of an underemployed workforce and cheap land costs. The positive coefficient for employment per km2 indicates that this may be the case. Its stronger coefficient implies that it matters more, employees per km2 is the most important driver of employment level growth in the model. This creates an unfortunate policy implication that may be explored in future research. Namely that the attraction of certain firms to a municipality is no guarantee for employment level growth and that the density of the workforce is the main driver of employment level growth. This however is not something that can be easily solved by policy, whereas attracting firms to an area is comparatively easier. While this is an oversimplification of the problem, this dimension still warrants further research in order to identify which drivers of employment level growth can be attracted to a municipality, and which ones occur more dynamically, such as employment per km2.

Model 2 analysed the employment growth of the research areas and the municipalities and showed almost uniformly statistically insignificant variables. This meant that no strong conclusions could be drawn from this regression model. This, along with the fact that the coefficient for treatment in model 1 was negative, means that the third hypothesis can be rejected. The XL distribution centre was not a driver for employment growth in the local economy.

The one variable that was statistically significant was employment density. The positive coefficient associated with this variable shows that greater employment density leads to greater levels of employment growth. Paragraph 3.9 theorized that perhaps the locations of the Loner type XL distribution centre were chosen based on the fact that they were in fact not thriving.

These areas could be seen as less economically active than the rest of the rest of the country, on average. The employment density can, along with the other covariates in the regression, be seen as an indicator of economic activity on the local level. Further research could identify

more clearly the characteristics of the area in which these firms choose to locate. The dimension of these areas possibly being underperforming areas when compared to the rest of the country needs to be explored further. This sort of research could fill the gap in the literature that has been explored in paragraph 3.9, namely that there are many different models that explain where distribution centres locate, but they tend to use drastically varying inputs. Analysing specifically which characteristics are present in the areas in which these firms locate in the Netherlands could fill this gap in the literature and reveal interesting policy implications.

6.5 Discussion regarding the hypotheses

In the end all three hypotheses had been rejected. The first hypothesis; there is a positive effect on the number of people employed in the local economy after the arrival of an XL distribution centre, can be rejected on the basis that there is no uniform positive growth over time among the research areas. The second hypothesis, there is a greater increase in employment levels over time in areas where an XL distribution centre was located than in similar areas where no distribution centre was located, after the moment of arrival, can be rejected based on the results of the second and third difference-in-differences analyses. These analyses show that the research areas do not outperform their reference areas in terms of employment level growth. The third hypothesis, the arrival of an XL distribution centre in an area is the source of the employment level growth observed on the local level, can be rejected based on the fact that model 1 showed negative coefficients for the variable ‘Treatment’ and model 2 showed no statistical significance for this variable.

The rejection of all three hypotheses undermines the employment growth argument used by the side in favour of constructing more XL distribution centres. If the most high-impact of these buildings do not produce greater levels of employment growth for the local economy, the argument that they supply jobs is drastically weakened. While the results of the analyses performed in this paper cannot fully rule out that employment level growth results from the location of a Loner type XL distribution centre in an area, it does not appear that the employment level growth takes place in the area affected by the construction of the building. That is to say: while employment level growth may occur as a result of the construction of a new Loner type XL distribution centre, it does not occur in the affected area.

6. Conclusions

The fact that neither of the difference-in-differences analyses show uniformly greater employment level growth in employment levels in the research areas shows that the first two hypotheses can be rejected. Furthermore, the regressions showed that the third hypothesis can also be rejected. The arrival of an XL distribution centre to an area is no guarantee for economic success.

The large number of new clusters that were formed between 2008 and 2018 from the original LLoner type XL distribution centres could be indicative of indirect employment effects and the flagship position of the first distribution centre. Even if an XL distribution centre may not guarantee employment level growth in an area, it could possibly have the effect drawing other businesses to the area.

The regression models revealed employment per km2 as the most important driver of employment level growth at the local level. This, and not the construction of more XL distribution centres increases employment in an area.

On the whole, the results of the analyses performed show that the argument used by proponents of constructing more XL distribution centres; it increases employment on the local level, is false. Employment level increases may be observed elsewhere, but on the local level XL distribution centres are not drivers of employment level growth.

7. References

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8. Appendix

	2009			Reference area for **Barneveld** area		
	Barneveld area			Gemeente Bloemendaal		
	percentage	0,348797		Percentage	0,78534	(Lowest available)
2009	2867		2009	1910		
2017/2018	2992		2018	3290		
			2017	3135		
			2017/2018	3212,5		
Difference	125		Difference	1302,5		
Diff %	4,359958		Diff %	68,19372		
		Difference in difference				
		-63,8338				
				Reference area for **Vlissingen** area		
	Vlissingen area			Gemeente Wageningen		
	percentage	1,073926		Percentage	1,04721	
2009	8008		2009	1910		
2017/2018	7091		2018	3060		
			2017	2925		
			2017/2018	2992,5		
Difference	-917		Difference	1082,5		
Diff %	-11,451		Diff %	56,67539		
		Difference in difference				
		-68,1264				

	2010			Reference area **Benningbroek** area	
	Benningbroek area			Gemeente Laren	
	percentage	0,937012		Percentage	0,967742
2010	1921		2010	1550	
2017/2018	1412		2018	2200	
			2017	2095	
			2017/2018	2147,5	
Difference	-509		Difference	597,5	
Diff %	-26,4966		Diff %	38,54839	
		Difference in difference			
		-65,045			
				Reference area for **Vlaardingen** area	
	Vlaardingen area			Gemeente Borne	
	percentage	1,167264		Percentage	1,176471
2010	7539		2010	1275	
2017/2018	7156		2018	2010	
			2017	1890	
			2017/2018	1950	
Difference	-383		Difference	675	
Diff %	-5,08025		Diff %	52,94118	
		Difference in difference			
		-58,0214			
				Reference area for **Waalwijk** area	
	Waalwijk area			Gemeente Urk	
	Percentage	6,76623		Percentage	6,694987
2010	3281		2010	1295	
2017/2018	3989		2018	1340	
			2017	1345	
			2017/2018	1342,5	
Difference	708		Difference	47,5	
Diff %	21,57879		Diff %	3,667954	
		Difference in difference			
		17,91083			
				Reference area for **Heteren** area	

	Heteren area			Gemeente Steenwijkerland	
	percentage	2,09546		Percentage	2,121641
2010	859		2010	3995	
2017/2018	928		2018	4235	
			2017	4295	
			2017/2018	4265	
Difference	69		Difference	270	
Diff %	8,032596		Diff %	6,758448	
		Difference in difference			
		1,274148			

	2011			Reference area for **Almere** area	
	Almere area			Gemeente Waalre	
	percentage	1,077821		Percentage	1,102941
2011	10113		2011	1360	
2017/2018	8929		2018	1975	
			2017	1915	
			2017/2018	1945	
Difference	-1184		Difference	585	
Diff %	-11,7077		Diff %	43,01471	
		Difference in difference			
		-54,7224			
				Reference area for **Kesteren** area	
	Kesteren area			Gemeente Teylingen	
	percentage	1,374705		Percentage	1,335878
2011	2546		2011	2680	
2017/2018	2498		2018	3650	
			2017	3465	
			2017/2018	3557,5	
Difference	-48		Difference	877,5	
Diff %	-1,88531		Diff %	32,74254	
		Difference in difference			
		-34,6278			

	2012			Reference area for **Drongelen** area	
	Drongelen area			Gemeente Westerveld	
	percentage	1,195652		Percentage	1,19403
2012	2760		2012	1675	
2017/2018	2745		2018	2390	
			2017	2290	
			2017/2018	2340	
Difference	-15		Difference	665	
Diff %	-0,54348		Diff %	39,70149	
		Difference in difference			
		-40,245			
				Reference area for **Groenlo** area	
	Groenlo area			Gemeente Sint Anthonins	
	percentage	1,325301		Percentage	1,382488
2012	2490		2012	1185	
2017/2018	3236		2018	1455	
			2017	1395	
			2017/2018	1425	
Difference	746		Difference	240	
Diff %	29,95984		Diff %	20,25316	
		Difference in difference			
		9,706675			

	2013			Reference area for **Sprang-Capelle** area	
	Sprang-Capelle area			Gemeente Hattem	
	percentage	1,111497		Percentage	1,197605
2013	2879		2013	935	
2017/2018	3929		2018	1175	
			2017	1135	
			2017/2018	1155	
Difference	1050		Difference	220	
Diff %	36,471		Diff %	23,52941	
		Difference in difference			
		12,94159			

				Reference area for **Beltrum** area	
	Beltrum area			Gemeente Blaricum	
	percentage	0,995438		Percentage	0,930233
2013	2411		2013	1075	
2017/2018	2711		2018	1575	
			2017	1530	
			2017/2018	1552,5	
Difference	300		Difference	477,5	
Diff %	12,44297		Diff %	44,4186	
		Difference in difference			
		-31,9756			

	2014			Reference area for **Maasdijk** area	
	Maasdijk area			Gemeente Edam Volendam	
	percentage	1,044386		Percentage	1,027397
2014	2681		2014	2920	
2017/2018	3148		2018	4615	
			2017	4425	
			2017/2018	4520	
Difference	467		Difference	1600	
Diff %	17,41887		Diff %	54,79452	
		Difference in difference			
		-37,3756			

				Reference area for **Maassluis** area	
	Maassluis area			Gemeente Grave	
	percentage	1,209373		Percentage	1,242236
2014	1323		2014	885	
2017/2018	1631		2018	1115	
			2017	1080	
			2017/2018	1097,5	
Difference	308		Difference	212,5	
Diff %	23,28042		Diff %	24,0113	
		Difference in difference			
		-0,73088			

Reference area for **Den Bosch** area

	Den Bosch area			Gemeente Gulpen-Wittem	
	percentage	0,813164		Percentage	0,858369
2014	10453		2014	1165	
2017/2018	11892		2018	1525	
			2017	1500	
			2017/2018	1512,5	
Difference	1439		Difference	347,5	
Diff %	13,76638		Diff %	29,82833	
		Difference in difference			
		-16,0619			
				Reference area for **Maasbracht** area	
	Maasbracht area			Gemeente Halderberge	
	percentage	3,268846		Percentage	3,2
2014	1479		2014	2900	
2017/2018	1694,5		2018	3085	
			2017	2955	
			2017/2018	3020	
Difference	215,5		Difference	120	
Diff %	14,57066		Diff %	4,137931	
		Difference in difference			
		10,43272			
				Reference area for **Duiven** area	
	Duiven area			Gemeente Huizen	
	percentage	1,340782		Percentage	1,310616
2014	2685		2014	3815	
2017/2018	2613		2018	4925	
			2017	4775	
			2017/2018	4850	
Difference	-72		Difference	1035	
Diff %	-2,68156		Diff %	27,12975	
		Difference in difference			
		-29,8113			
	2015			Reference area for **Beek** area	
	Beek area			Gemeente Delfzijl	
	percentage	65,94626		Percentage	13,04348
2015	1712		2015	1795	

2017/2018	2015		2018	1810	
			2017	1801	
			2017/2018	1805,5	
Difference	303		Difference	10,5	
Diff %	17,6986		Diff %	0,584958	
		Difference in difference			
		17,11364			
				Reference area for **Enschede** area	
	Enschede area			Gemeente Mook en Middelaar	
	percentage	0,344931		Percentage	0,613497
2015	6668		2015	815	
2017/2018	6209		2018	870	
			2017	835	
			2017/2018	852,5	
Difference	-459		Difference	37,5	
Diff %	-6,88362		Diff %	4,601227	
		Difference in difference			
		-11,4849			
				Reference area for **Kampen** area	
				Gemente Nuenen, Gerwen en	
	Kampen area			Nederwetten	
	percentage	1,181335		Percentage	1,174618
2015	5079		2015	2555	
2017/2018	5899		2018	2800	
			2017	2675	
			2017/2018	2737,5	
Difference	820		Difference	182,5	
Diff %	16,14491		Diff %	7,142857	
		Difference in difference			
		9,002053			
				Reference area for **Nieuwe Pekela** area	
	Nieuwe Pekela area			Gemeente Diemen	
	percentage	4,728132		Percentage	4,761905
2015	767		2015	2520	
2017/2018	864		2018	2625	
			2017	2612	
			2017/2018	2618,5	

Difference	97		Difference	98,5	
Diff %	12,64668		Diff %	3,90873	
		Difference in difference			
		8,737945			
	2016			Reference area for **Leiden** area	
	Leiden area			Gemeente Baarle-Nassau	
	percentage	1,612277		Percentage	1,630435
2016	5148		2016	920	
2017/2018	5256		2018	980	
			2017	945	
			2017/2018	962,5	
Difference	108		Difference	42,5	
Diff %	2,097902		Diff %	4,619565	
		Difference in difference			
		-2,52166			
				Reference area for **Breda** area	
	Breda area			Gemeente Bunschoten	
	percentage	1,486014		Percentage	1,401869
2016	3432		2016	2140	
2017/2018	3222		2018	2310	
			2017	2210	
			2017/2018	2260	
Difference	-210		Difference	120	
Diff %	-6,11888		Diff %	5,607477	
		Difference in difference			
		-11,7264			
				Reference area for **Deurningen** area	
	Deurningen area			Gemeente Bronckhorst	
	percentage	1,067553		Percentage	1,048951
2016	5714		2016	4290	
2017/2018	6411		2018	4550	
			2017	4410	
			2017/2018	4480	
Difference	697		Difference	190	
Diff %	12,19811		Diff %	4,428904	
		Difference in difference			
		7,769205			

	2017			Reference area for **Lelystad** area	
	Lelystad area			Gemeente Beemster	
	percentage	2,793914		Percentage	2,777778
2017	3615		2017	1260	
2018	3929		2018	1315	
			Differenc		
Difference	314		e	55	
Diff %	8,68603		Diff %	4,365079	
		Difference in difference			
		4,320951			
				Reference area for **Nijmegen** area	
	Nijmegen area			Gemeente Buren	
	percentage	3,619048		Percentage	3,612717
2017	525		2017	3460	
2018	562		2018	3565	
			Differenc		
Difference	37		e	105	
Diff %	7,047619		Diff %	3,034682	
		Difference in difference			
		4,012937			

Table 15: Difference-in-differences analysis for the research areas and reference areas.

2009

Barneveld area			**The Netherlands**	
percentage	0,348797			
2009	2867		2009	8103419
2017/2018	2992		2017/2018	8465910
Difference	125		Difference	362491
Diff %	4,359958		Diff %	4,473309

Difference in difference

-0,11335

Vlissingen area			**The Netherlands**	
percentage	1,073926			
2009	8008		2009	8103419
2017/2018	7091		2017/2018	8465910
Difference	-917		Difference	362491
Diff %	-11,451		Diff %	4,473309

Difference in difference

-15,9244

2010

Benningbroek area			**The Netherlands**	
percentage	0,937012			
2010	1921		2010	8174293
2017/2018	1412		2017/2018	8465910
Difference	-509		Difference	291617
Diff %	-26,4966		Diff%	3,567489

Difference in difference

-30,0641

Vlaardingen area			**The Netherlands**	
percentage	1,167264			
2010	7539		2010	8174293
2017/2018	7156		2017/2018	8465910
Difference	-383		Difference	291617
Diff %	-5,08025		Diff%	3,567489

Difference in difference

-8,64774

Waalwijk area	**The Netherlands**

	Percentage	6,76623		
2010	3281		2010	8174293
2017/2018	3989		2017/2018	8465910
Difference	708		Difference	291617
Diff %	21,57879		Diff%	3,567489
		Difference in difference		
		18,0113		
	Heteren area			**The Netherlands**
	percentage	2,09546		
2010	859		2010	8174293
2017/2018	928		2017/2018	8465910
Difference	69		Difference	291617
Diff %	8,032596		Diff%	3,567489
		Difference in difference		
		4,465107		
	2011			
	Almere area			**The Netherlands**
	percentage	1,077821		
2011	10113		2011	8248956
2017/2018	8929		2017/2018	8465910
Difference	-1184		Difference	216954
Diff %	-11,7077		Diff %	2,630078
		Difference in difference		
		-14,3378		
	Kesteren area			**The Netherlands**
	percentage	1,374705		
2011	2546		2011	8248956
2017/2018	2498		2017/2018	8465910
Difference	-48		Difference	216954
Diff %	-1,88531		Diff %	2,630078
		Difference in difference		
		-4,51539		
	2012			

	Drongelen area			**The Netherlands**
	percentage	1,195652		
2012	2760		2012	8231881
2017/2018	2745		2017/2018	8465910
Difference	-15		Difference	234029
Diff %	-0,54348		Diff %	2,842959
		Difference in difference		
		-3,38644		
	Groenlo area			**The Netherlands**
	percentage	1,325301		
2012	2490		2012	8231881
2017/2018	3236		2017/2018	8465910
Difference	746		Difference	234029
Diff %	29,95984		Diff %	2,842959
		Difference in difference		
		27,11688		
	2013 Sprang-Capelle area			**The Netherlands**
	percentage	1,111497		
2013	2879		2013	8150731
2017/2018	3929		2017/2018	8465910
Difference	1050		Difference	315179
Diff %	36,471		Diff %	3,86688
		Difference in difference		
		32,60412		
	Beltrum area			**The Netherlands**
	percentage	0,995438		
2013	2411		2013	8150731
2017/2018	2711		2017/2018	8465910
Difference	300		Difference	315179
Diff %	12,44297		Diff %	3,86688
		Difference in difference		
		8,57609		

2014

	Maasdijk area		**The Netherlands**	
	percentage	1,044386		
2014	2681		2014	8095757
2017/2018	3148		2017/2018	8465910
Difference	467		Difference	370153
Diff %	17,41887		Diff %	4,572185
		Difference in difference		
		12,84669		

	Maassluis area		**The Netherlands**	
	percentage	1,209373		
2014	1323		2014	8095757
2017/2018	1631		2017/2018	8465910
Difference	308		Difference	370153
Diff %	23,28042		Diff %	4,572185
		Difference in difference		
		18,70824		

	Den Bosch area		**The Netherlands**	
	percentage	0,813164		
2014	10453		2014	8095757
2017/2018	11892		2017/2018	8465910
Difference	1439		Difference	370153
Diff %	13,76638		Diff %	4,572185
		Difference in difference		
		9,194198		

	Maasbracht area		**The Netherlands**	
	percentage	3,268846		
2014	1479		2014	8095757
2017/2018	1694,5		2017/2018	8465910
Difference	215,5		Difference	370153
Diff %	14,57066		Diff %	4,572185
		Difference in difference		
		9,998471		

	Duiven area		**The Netherlands**	
	percentage	1,340782		
2014	2685		2014	8095757
2017/2018	2613		2017/2018	8465910
Difference	-72		Difference	370153
Diff %	-2,68156		Diff %	4,572185
		Difference in difference		
		-7,25375		
	2015			
	Beek area		**The Netherlands**	
	percentage	65,94626		
2015	1712		2015	8131451
2017/2018	2015		2017/2018	8465910
Difference	303		Difference	334459
Diff %	17,6986		Diff %	4,113153
		Difference in difference		
		13,58545		
	enschede area		**The Netherlands**	
	percentage	0,344931		
2015	6668		2015	8131451
2017/2018	6209		2017/2018	8465910
Difference	-459		Difference	334459
Diff %	-6,88362		Diff %	4,113153
		Difference in difference		
		-10,9968		
	Kampen area		**The Netherlands**	
	percentage	1,181335		
2015	5079		2015	8131451
2017/2018	5899		2017/2018	8465910
Difference	820		Difference	334459
Diff %	16,14491		Diff %	4,113153
		Difference in difference		
		12,03176		

	2016			
	leiden area		**The Netherlands**	
	percentage	1,612277		
2016	5148		2015	8241510
2017/2018	5256		2017/2018	8465910
Difference	108		Difference	224400
Diff %	2,097902		Diff %	2,722802
		Difference in difference		
		-0,6249		
	Breda area		**The Netherlands**	
	percentage	1,486014		
2016	3432		2015	8241510
2017/2018	3222		2017/2018	8465910
Difference	-210		Difference	224400
Diff %	-6,11888		Diff %	2,722802
		Difference in difference		
		-8,84168		
	Deurningen area		**The Netherlands**	
	percentage	1,067553		
2016	5714		2015	8241510
2017/2018	6411		2017/2018	8465910
Difference	697		Difference	224400
Diff %	12,19811		Diff %	2,722802
		Difference in difference		
		9,475308		
	2017			
	Lelystad area			**The Netherlands**
	percentage	2,793914		
2017	3615		2017	8370374
2018	3929		2018	8561446
Difference	314		Difference	191072
Diff %	8,68603		Diff %	2,282718
		Difference in difference		
		6,403313		
	Nijmegen area			**The Netherlands**

	percentage	3,619048		
2017	525		2017	8370374
2018	562		2018	8561446
Difference	37		Difference	191072
Diff %	7,047619		Diff %	2,282718
		Difference in difference		
		4,764901		

Table 16: Difference-in-differences analysis for the research areas and the entire country.

model 1

Coefficients[a]

Model				Standardized Coefficients	t	Sig.
				Beta		
1	(Constant)	-9495,686	5136,405		-1,849	0,065
	Werkenden per km2	4,000	0,444	0,435	9,014	0,000
	Netto arbeidsparticipatie	145,165	75,341	0,092	1,927	0,055
	Direct employment in sector	-353,363	157,939	-0,108	-2,237	0,026
	Delta with treatment per year	3,977	1,528	0,182	2,604	0,010
	Treatment	-4511,617	2272,600	-0,271	-1,985	0,048
	years with	606,965	347,558	0,200	1,746	0,082

a. Dependent Variable: Total employment change

Table 17: regression output model 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	#########	6	#########	15,902	,000[b]
	Residual	#########	348	#########		
	Total	#########	354			

a. Dependent Variable: Total employment change

b. Predictors: (Constant), years with, Werkenden per km2, Netto arbeidsparticipatie, Direct employment in sector, Delta with treatment per year, Treatment

Table 18: ANOVA for model 1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,464[a]	0,215	0,202	3876,654

a. Predictors: (Constant), years with, Werkenden per km2, Netto arbeidsparticipatie, Direct employment in sector, Delta with treatment per year, Treatment

Table 19: model summary for model 1

Model 2

Coefficients[a]

Model				Standardized Coefficients Beta	t	Sig.
2	(Constant)	-259,336	294,815		-0,880	0,380
	Werkenden per km2	3,883	0,430	0,428	9,037	0,000
	Direct employment in sector	-39,136	56,790	-0,033	-0,689	0,491
	Delta with treatment per year	3,450	5,839	0,034	0,591	0,555
	Treatment	278,956	2030,765	0,017	0,137	0,891
	years with	-43,636	339,280	-0,014	-0,129	0,898

a. Dependent Variable: Total employment change

Table 20: regression output for model 2

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	#########	5	#########	16,739	,000[b]
	Residual	#########	375	#########		
	Total	#########	380			

a. Dependent Variable: Total employment change

b.
Predictors:
(Constant),
years with,
Direct
employment
in sector,
Werkenden
per km2,
Delta with
treatment
per year,
Treatment

Table 21: ANOVA for model 2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,427[a]	0,182	0,172	3819,833

a.
Predictors:
(Constant),
years with,
Direct
employment
in sector,
Werkenden
per km2,
Delta with
treatment
per year,
Treatment

Table 22: model summary for model 2