

Isolation as a blessing

Empirical research on the accessibility of Groningen and its economic prosperity

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Summary

Accessibility can be a factor that influences the economic development of places. This research focused on how the accessibility of Groningen, the biggest city in the northern Netherlands affects its economic prosperity. Groningen is by itself quite isolated from greater urban areas but facilitates a hub-function for the region.

The main research question for this research was: *How does the accessibility of Groningen influences its economic prosperity?* This research question was answered by conducting a qualitative research on determinants of accessibility and economic prosperity. Before conducting the actual research, the researcher conducted a literature review. After analyzing the interviews, a direct relationship between transport infrastructure and economic development was discovered. The presence of transport infrastructure makes the process of doing transactions between people and businesses possible. An example from Groningen is the construction of the Europapark area. Where transport infrastructure facilitates employees of offices and public services resulting in a lot of economic activity.

There is no direct relationship between transport infrastructure and innovation, however transport infrastructure does have a fostering effect on innovation. This is due to the fact that transport infrastructure allows the process of matching, learning and sharing happen faster, which is a requirement for innovation. The Zernike area in Groningen is a knowledge cluster in Groningen where transport infrastructure facilitates this process of knowledge sharing.

Finally, we can conclude from the results that the current transport infrastructure in Groningen does exclude certain groups from economic opportunities. These groups are: people with low income, elderly, people with mobility problems and residents of more rural areas.

After taking all things into consideration, the accessibility of Groningen can be improved but its isolation from other major urban areas results in having services and amenities that it wouldn't have had if it was more connected. There are three recommendations for bettering the accessibility of Groningen and therefore improving its economic prosperity. First of all, could the construction of the Lelylijn could improve the overall competitiveness of Groningen, by making it more accessible from places that currently are not connected to the railroad system. This will lead to a bigger consumer and labor market. Secondly, the national government could improve public transport by making it more affordable and accessible for the vulnerable groups that currently miss out on their economic opportunities, due to an inefficient transport network. The last recommendation for improving the accessibility and economic prosperity of Groningen, is investing in more shared mobility options. This will not only reduce the car usage in and around the city but also reduces fossil fuel emissions. By reducing car dependency, less investments in new roads are necessary which can lead to cost savings.

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1. Introduction

Good accessibility is essential for a city to continue to grow and develop economically. Groningen is the economic heart of the northern provinces. The city itself has over 200,000 residents, and every day another 180,000 people travel to or through the city for work, education, health care and other services (Gemeente Groningen, 2024). Despite its hub-function for the Northern provinces, there is a large economic gap with other large urban regions such as the Randstad.

In recent years, several plans have been made to better the connection between Groningen and larger urban areas such as the Randstad and western Germany. The construction of new transportation infrastructure should not only reduce travel time but also bring new economic opportunities. The plans to build a new train connection between Groningen and the Randstad have existed for more than thirty years, however, now something actually seems to be happening. In fact, the government has earmarked three billion euros to build the so-called Lelylijn and is in discussions with the provinces of Groningen, Friesland and Drenthe about the route of the connection (Ministerie van Binnenlandse Zaken, 2023). The railroad line should become part of the so-called TEN-T network. An instrument of the European Commission that connects transportation infrastructure such as rail lines, highways and seaports efficiently on a European scale (European Commission, 2024). The results of the project are difficult to predict as there are many factors influencing the project. Based on personal experience, there are also plenty of people in the northern provinces who actually like the distance from the Randstad. So, we should not look only into economic actors but also social differences.

In addition to the initiatives for the new rail lines, a huge transportation infrastructure project has been underway in Groningen for seven years. The Zuidelijke-Ringweg used to be the best-known traffic bottleneck in the Northern Netherlands. This is because the city of Groningen, with all its amenities and economy, is a major draw to the region. Every morning, thousands of motorists are stuck in traffic jams before they can drive into or get around the city. The conversion of the gateway to the city should lead to improved accessibility, traffic flow, livability and safety (Projectbureau Aanpak Ring Zuid, 2024). However, should the government not have looked for alternative ways for addressing the problem?

This research seeks to investigate: *how accessibility influences the economic prosperity of the city of Groningen?* This will be done by answering the qualitative research question: *How does the accessibility of the city of Groningen affect its economic prosperity?* Answering this main research question will be done by answering three sub-questions: (1) *How does transport infrastructure influence economic development?* (2) *How does transport infrastructure influence innovation?* (3) *How does transport infrastructure impact the economic opportunities of diverse groups?*

Little research has been done on Groningen's accessibility and how it relates to its economic progress. The research of Pot et al. (2021) did show that the perceived distance between Groningen and other urban regions is considered greater than it actually is. According to Arimah (2017) accessibility contributes to the economic prosperity of cities when infrastructure is well managed and developed. It drives economic growth by providing access to health, education and ensures safety. Economic prosperity can be defined as sustainable economic growth, with high levels of innovation and equally distributed economic opportunities (Yong, 2019).

This research paper will continue with the theoretical framework. In this part of the paper, we will take a deep dive in relevant literature concerning the relationships of the main components, resulting in a conceptual model. After the theoretical framework the paper continues with the methodology section. In this chapter the way of data collection, processing and analyzing will be discussed. Just like the quality of the data and ethical considerations. Chapter four is all about the result of this research. Following the results is chapter five, the discussion and conclusions. In this chapter the results will be compared to the researcher's expectations and recommendations for future research given.

2. Theoretical framework

For several decades the relationship between accessibility and economic prosperity has been a great point of interest of researchers and politicians. Adequate accessibility contributes to the sustainability, economic opportunities and overall attractiveness of places. Accessibility requires sufficient transport infrastructure. According to Handy and Niemeier (1997) accessibility is determined by the spatial distribution of potential destinations, the ease of reaching each destination and the extent, quality and nature of the activities that can be found there. Travel costs are central to this concept: the less time and money that goes into travel, the more places can be reached within a given budget and the better the accessibility. Accessibility is usually evaluated by using indicators from spatial data that lack the needs, desires and abilities of individuals. Resulting in a mismatch on how accessibility actually is perceived. People living in rural areas experience more difficulties in attaining desired activities. Their remoteness results in less frequent public transport and higher reliance on car mobility. The lack of agglomeration economies limits the opportunity to access economic and social opportunities (Pot et al, 2021). The research of Chen et al. (2023) showed that improving the connectivity of rural areas to socioeconomic centers results in more economic activity. Current transportation infrastructure and systems are used above capacity, suffer from lack of space and have high maintenance costs. This is a result of the increasing urbanization that causes more stress to the existing transport infrastructure. Also, the way how most of the current transport infrastructure is designed does not match the current needs of today's society resulting in urban mobility problems (Yannis & Chaziris, 2022). According to Park (2020) the quality of transport infrastructure and logistics are important determinants for creating comparative advantages. The transportation sector affects all aspects of human life such as research, entertainment, trade, development, culture and defense (Alam et al., 2021). Countries providing high quality transport infrastructure and more efficient logistics services have a cost advantage in the delivery and production of goods for which logistic services are important. I expect based on the literature that improving the quality of the transport infrastructure has a positive effect on the economic development of Groningen.

In 2023 the European Commission released the regional innovation scoreboard. This is an overview of the most innovative regions in Europe. The province of Groningen is already a strong innovator compared to other regions in Europe. However, there are several provinces in the Netherlands that are so called innovation leaders. Innovation is a concept that can be defined and measured in several ways. According to Kotsemir et al. (2013) the basic definition of innovation is given by the Organization for Economic Cooperation and Development (OECD). The concept can be defined as: "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (OECD, 2005, p. 46). Measuring innovation is tricky but can be approached in several ways. One such way is to count the number of patent applications in a specific region. This type of measurement is imperfect because patents vary in importance and quality (Shambaugh et al., 2017). For the creation of new products, processes and business ideas there are certain inputs required. Transport infrastructure makes the physical interaction of people, goods and knowledge possible. It also removes physical boundaries. The research of Ridley et al. (2006) states that the absence of adequate infrastructure services is one of the main problems that hinder development and technological innovation in Africa. Therefore, transport infrastructure should be looked at as a catalyst for more innovation. The study of Rehman et al. (2023) on transport infrastructure and inclusive economic growth in South Asian economies did not find a positive correlation between improving transport infrastructure and innovation in contradiction to what the researcher expected. The outcomes of research can therefore vary across geographical context. Therefore its plausible to

assume that transport infrastructure has a fostering effect on the innovation in the city of Groningen, resulting in more economic development.

An inclusive transport system is a system that provides ease and ensures unrestricted access to jobs and services for all people no matter their circumstances. Currently there are 80 million Europeans who have a long-term disability. By creating an adequate transportation infrastructure and systems resident their mobility rights are guaranteed (European Commission, 2023). Besides people with a disability there are millions of people that will benefit from a comprehensive transportation network and infrastructure. These people suffer from so called transport poverty. This is a complex concept defined by Lucas et al. (2016). Transport poverty exists out of transport affordability. This the inability of certain people to afford the costs of transport. Mobility poverty, the lack suitable transportation options. Accessibility poverty, this is the difficulty of reaching employment, healthcare services, job opportunities and the exposure to transport externalities. According to Cottril et al. (2020) The interrelationship of these individual concepts provides the best picture of how transport poverty is experienced. Transport poverty varies across geographical areas. Residents of areas with higher population density, more connectivity and mixed land use experience less transportation poverty than those living in more remote areas with less connectivity. This is due to the fact that residents of less urban areas have less amenities in within their walking or biking distance (Saelens et al., 2003). Maggazzino and Mele (2021) claim that there is a direct relationship between poverty reduction and transportation infrastructure. Their research aimed at the construction of highways trough provinces of China, connecting distant villages. After analysis they concluded that villages that were connected to the highway system experienced more economic growth, more social development and poverty reduction, than villages that were not connected to the system. As the transportation infrastructure improved, revenue increased and more households could afford to buy engines and cars. According to (Rehman et al., 2023), creating good transportation infrastructure is the best way to ensure that all residents benefit from a growing economy and not just the rich. This is because good infrastructure gives access to more job opportunities, factor mobility and economic facilities. Based on the literature mentioned above it could reasonably be expected that an efficient transportation infrastructure with services that do not exclude vulnerable groups, have a positive influence on their economic opportunities.

The conceptual model is a physical representation of the variables considered in this research. Figure 1. illustrates the variables considered in this research. The independent variable is transport infrastructure. The dependent variable is economic development. quality of the transport infrastructure directly influences the dependent variable economic prosperity. Transport infrastructure influences innovation and the access of people to social and economic opportunities. These mediating variables contribute to economic prosperity. The mediating variables are indicators of the relationship between the independent and dependent variable.

Quality

The quality of transport infrastructure and an efficient logistic network enhance economic development. It can be seen an essential component in international competitiveness. The flow of goods can be heavily affected by the quality of the transport infrastructure. Low quality of infrastructure affects a countries opportunity to integrate into the world economy. A well-developed infrastructure results in lower transportation costs and brings labor and capital closer to each other (Senquiz-Diaz, 2021). Transport infrastructure includes roads, railroads, sea- and airports. The World Economic Forum (2011) published a list of the quality of transport infrastructure. The Netherlands noted a 10th place of overall infrastructure when compared 143 other countries. From the report can be concluded that the seaport infrastructure is excellent being crowned the best in the world.

However, the road and railroad infrastructure could be improved. The results were measured through asking the public how they assess the quality of infrastructure in their home country.

Innovation

The theoretical framework already provided a general definition of innovation. This concept of the OECD is widely accepted among researchers. Gault (2018) provides the four types of innovation. Product innovation, production or delivery innovation, organizational innovation and lastly a marketing or communication innovation. In this research the general definition of the OECD (2005) will be used because the research does not focus on any specific type of innovation.

Availability

The availability of transport infrastructure influences people their economic opportunities. However, the availability of transport infrastructure for certain groups is limited. From the research of Maggazzino and Mele (2021) can be concluded that the construction of new infrastructure results in more economic prosperity. The research of Anyanwu and Erhijakpor (2010) states that the construction of road infrastructure directly contributes to poverty reduction in Africa. Due to the fact that it can lead to higher farm productivity, employment income opportunities and availability of goods and services. Therefore, the availability of infrastructure should be looked into to better economic prosperity.

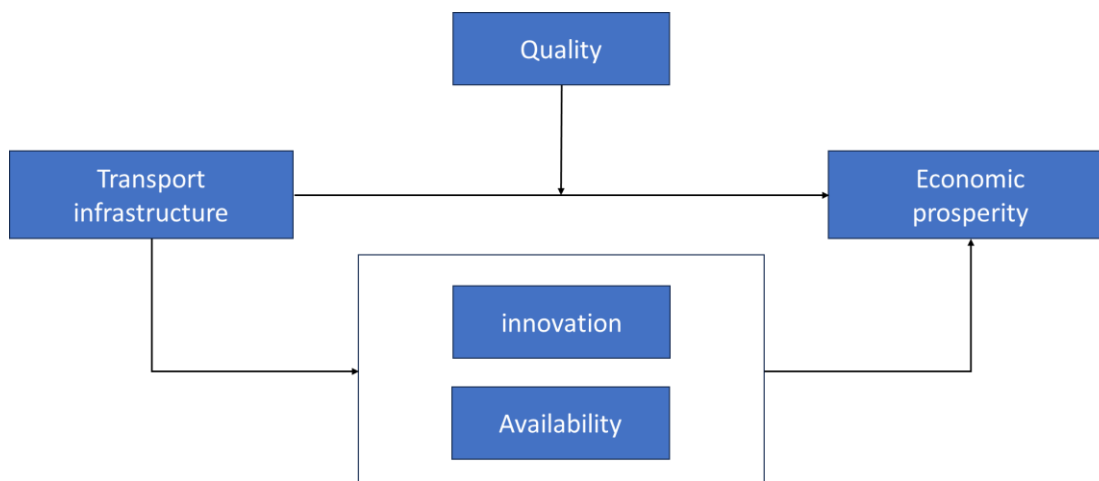


Figure 1. Conceptual model

3. Methodology

In this section of the paper the researcher will firstly address the main and secondary research questions. After addressing the research questions once again, the choice of research method will be clarified. This section is followed by how the data collection process went and the quality of the data. Finally, there will be a brief discussion about ethical considerations and data management.

3.1 Research questions

The main research question of this research is:

- How does the accessibility of the city Groningen affect its economic prosperity?

For answering the main research question the following three secondary questions were formulated:

- *How does transport infrastructure influence economic development?*
- *How does transport infrastructure influence innovation?*
- *How does transport infrastructure impact the economic opportunities of diverse groups?*

3.2 Research method and data collection

After a lot of consideration, it was decided that the most appropriate way of conducting this research was through a qualitative manner. Interviews give the opportunity to capture diverse perspectives from various stakeholders. By interviewing these various stakeholders like governmental institutions, academia and professionals, hidden implications and new ideas can be discovered. The relationship between the accessibility of Groningen and its economic development has been reviewed by conducting eight semi-structured interviews.

This study followed the same research design as the study of Burtina et al (2020) concerning emerging mobility, in which they also used semi-structured interviews. Questions were provided on forehand to the interviewees. In contradiction to the study of Burtina et al (2020) not only governmental institutions were approached for interviews but also academia and experts from organizations that perform activities that influence the accessibility of the city of Groningen. A widely accepted approach on judging someone on expertise is considering their years of experience in a particular working field (Shanteau et al., 2002). The researcher took the years of experience into consideration when he approached a respondent.

The population of potential respondents of this research consisted of representatives of governmental institutions, academia and professionals with an understanding of the accessibility and economic situation of Groningen. This population is relatively small and was not easy to get in touch with. This resulted in that the researcher had to exclude certain forms of sampling. Eventually the chosen sampling strategy, was snowball sampling. This was because the researcher had a few so called "seeds", being an academia and a professional. By using their referrals, the researcher was able to conduct the minimum number of interviews and get to a comprehensive answers of the research questions.

Table 1. Overview of the respondents

| Respondents: | Type of organization: | Role: |
|---------------------|------------------------------|---|
| Respondent 1 | Engineering consultancy | Project manager |
| Respondent 2 | Academic institution | Researcher |
| Respondent 3 | Academic institution | Assistant professor |
| Respondent 4 | Academic institution | Researcher |
| Respondent 5 | Governmental institution | Mobility consultant |
| Respondent 6 | Engineering consultancy | Project manager |
| Respondent 7 | Academic institution | Researcher |
| Respondent 8 | Governmental institution | Mobility consultant and advisor spatial economics |

3.3 Data management and processing

Conducting interviews is a form of primary data collection. Therefore, the rules of GDPR apply to this study. The primary data gathered during the interviews is stored in the X-drive of the UG network. By storing the data in the X-drive it is protected and accessible for the researcher from multiple devices. The researcher will save the data for the maximum period of one year before it will be deleted. This is done to give the researcher the possibility to use it for further analyses. Interviewees all signed an agreement (see appendix B) in which they give permission for the recording, processing and future analyses of the gathered data. The form also stated that their personal data will be deidentified by the researcher. The personal data gathered during the interview consisted of: name, job and nationality. Respondents of this research did not belong to a vulnerable group. The interviews were all audio-recorded and the researcher did not make additional notes during the interviews. After the interviews the researcher started with the manually transcription of the conversations. The ATLAS.ti analysis proved to be a challenge and had to be repeated for eight times. After coding, the related codes were bundled and divided into categories. Then the process of finding relationships between the categories and codes started. Resulting in the creation of a so called “theory tree”, that can be seen as a graphical impression of the main concepts of this research. From these concepts new theories were developed.

3.4 Research Ethics

Because this study involves primary data collection it had to comply with the European General Data Protection Regulation (GDPR). This is a regulation that establishes rules for processing personal data and aims to protect the rights of natural persons (Intersoft consulting, 2016). Respondents had to provide written consent for the recording and processing of the interviews. The consent form is included in the appendices. This form states, among other things, that the anonymity of the respondent will be guaranteed, that information will not be shared with third parties and that the respondent has the right to view transcripts. To reduce bias concerning a preferred mode or design of transport infrastructure, the interviews were taken with respondents from different organizations with different backgrounds. This contributed to getting more inclusive and balanced answers. None of the respondents belonged to a vulnerable group as they were all adults.

4. Results

Transportation infrastructure is an important prerequisite for the exchange of goods, people and information. Improving and constructing more transportation infrastructure improves connectivity and reduces travel time, allowing transactions to take place faster and against lower costs. The construction of roads in rural areas has historically ensured that the mobility of people and goods improved. This improved mobility results in more economic transactions. The use of transportation infrastructure varies by sector. For example, building new railroads and stations will mainly bring additional benefits to the service sector. Respondent 2, "People who take the train tend to be higher educated, because their work is concentrated around stations. A construction worker will not benefit much from a new rail line." These results align with the research of Anyanwu and Erhijakpor (2010), in which they concluded that the building new infrastructure resulted in more economic development in Africa. This research has in combination with the existing literature proved that bettering the transport infrastructure has a positive influence on the economic development of places. There are no signs that Groningen will be an exception to this phenomena.

Complementary companies like to locate near each other. Respondent 5 quotes, "The government tries to promote the clustering of public services and businesses by creating mobility-hubs." An example from Groningen is the Europapark area, where offices, educational institutions and a football stadium are all located in a radius of less than a few hundred meters from the train and bus station. Clustering occurs in different places and different proportions. The place where most clustering occurs in the Netherlands is the Randstad. The average travel time between Groningen and this region is two hours. However the perceived distance between these places affects the number of economic transactions between companies from Groningen and the Randstad. Respondent 4 noted, "Groningen will always remain a remote outskirt for someone from Amsterdam, but an American will laugh about it." Reducing the travel time between these economic zones could lead to two potential outcomes: the most plausible outcome is that companies from the Randstad will swallow up Groningen's competitors through economies of scale. This is the most economically efficient outcome and will come at the expense of local employment. The alternative outcome is that a better connection to the Randstad and places laying in between ensures the creation of a larger market and that more potential employees can be reached.

On a smaller scale there are number of small innovative clusters in Groningen. Respondent 8 states, "The businesses that are now located at the Suikerzijde are there to create vibrance. With the construction of the new residential neighborhood they can get permanent housing." The Suikerzijde already is accessible by bus and after the construction of the train station it will be connected to the railroad system, making it accessible by all forms of public transport. The research of Acheampong et al. (2022) supports the claim that the construction of transport infrastructure in the EU supports the levels of innovation and therefore also contributes to economic growth. The combination of the findings of this study and empirical evidence suggests that the construction of transport infrastructure has a positive influence on innovation.

The construction of transport infrastructure does not directly result in more innovation. This is due to the fact that innovation requires high level interaction between complementary businesses and people. Transport infrastructure does however contribute to innovation by making these interactions possible. The construction of transportation networks increases the pool of potential workers. This is because people can travel further distances in a shorter time. the construction of transport infrastructure ensures that the commuting costs of workers decrease and that this increases their labor mobility. Therefore, transport infrastructure should be seen as an important catalysator of innovation. Because it fastens high-level transactions and interactions of people and goods. Respondent 4 quotes, "every municipality in the Netherlands does have a business park located close next to a highway, however almost all of these business park initiatives result in failure because infrastructure alone is not enough." Innovation begins in in small creative incubators. Which

can later grow into truly innovative clusters through upscaling. Creative incubators often consist of several start-ups working together. There are a number of small clusters in Groningen. These include the Suikerzijde and the Hortusbuurt. Respondent 6 states, “at smaller creative hubs the government has a smaller role but when you get to a larger scale, say, at some point with large clusters, of course you need resources to get people there. Yes. And then transportation, infrastructure I think is going to play a very big role again.” The Zernike complex is a good example of a high-quality innovation and knowledge cluster where adequate transportation infrastructure ensures that thousands of people can work and study there every day. Third places also contribute to the levels of innovation. Third places are cafes, bars and restaurants where employees from different companies come together after working hours to relax. In Groningen these third places do exist but are not as large or accessible as they are in the Randstad.

Groningen's geographic location causes it to be somewhat isolated from the rest of the country. Respondent 3 stated, “isolation has its benefits but isolation also generates a lower level of competition in the economic sphere which can hinder growth.” Therefore it is not able to compete with larger urban areas. Respondent 8 noted, “For the development of the Northern-Netherlands we really need a better railroad connection to stay accessible for not only other parts of the Netherlands but also internationally. “If Groningen wants to compete with other big urban areas in the Netherlands and Western-Europe it has to get a better connection with not only the Randstad but also with cities in Germany like Hamburg and Bremen. In the northern provinces there are several innovation clusters like in Drachten and the Eemshaven that will also benefit from the construction of the Lelylijn. Figure 2. Gives an impression of the to be constructed lelylijn.

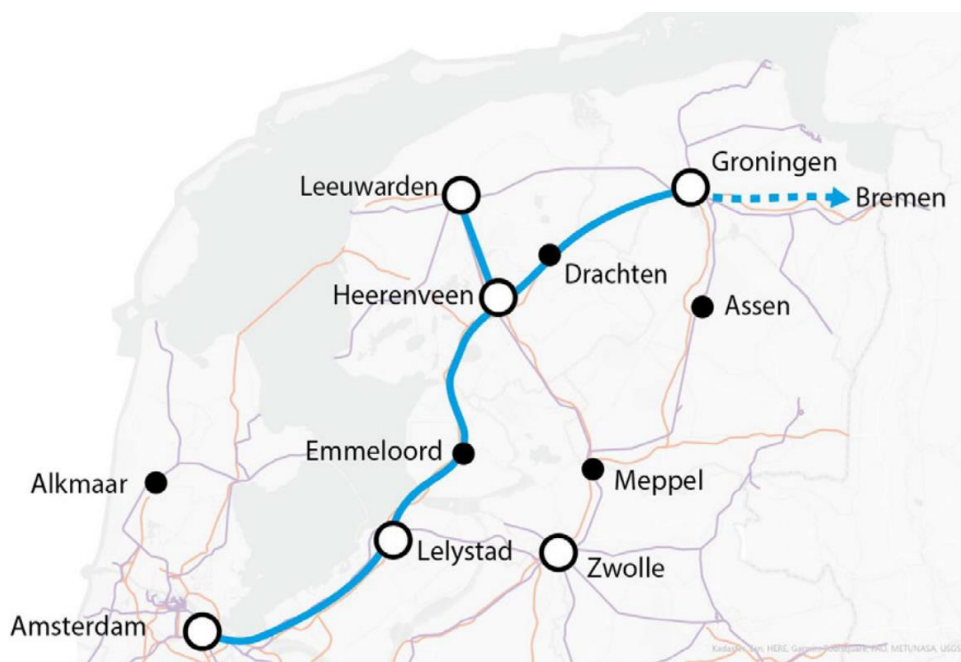


Figure 2. Route Lelylijn, Retrieved from Omroep Flevoland (2023).

Despite its isolation, Groningen fulfills an important hub-function for the region. It offers job-opportunities, healthcare facilities and educational institutions. Respondent 7 noted, “every day around 160.000 people enter the city, most of them by car.” This daily influx almost doubles the population of the city and causes traffic congestion at the main gateways of the city. The best known bottleneck being the Zuidelijke-Ringweg. Car ownership, car dependency and governmental decisions being the main causes for this congestion. On average households in the region of Groningen possess 1.2 cars. The Zuidelijke-Ringweg has been redeveloped in the past seven years and will be finally

completed in 2024. The redevelopment involved adding extra driving lanes, the construction of bridges, tunnels and the removal of trafficlights. Respondent 3 stated "there is international evidence for this and I don't see why Groningen is an exception. Extending road networks will prompt greater car use because it reduces the costs associated with using cars." People will choose the most flexible and cheapest form of mobility. Therefore the redevelopment of the Zuidelijke-Ringweg will result in more car use in and around Groningen.

Diverse groups are affected by how the transportation infrastructure is designed. Their economic opportunities are limited if they do not have access to transport infrastructure that is easily accessible and affordable. Groups that are the most affected by an inadequate transportation network are people who have low income, live in more rural areas, have disabilities or are elderly. These are also the groups that will benefit the most when the transportation network is properly designed and accessible. There are also differences between residents with a higher or lower educational degree. This is due to the fact that lower-skilled jobs are more often located outside economic zones around train stations. The construction of highspeed railways can therefore not be seen as a possible solution to spreading welfare across all population groups. People who have a lower educational degree will benefit more from better car or bus accessibility. This is in contrast to people with a higher educational degree, this group will mainly benefit from better public transportation.

The Groningen City Council decided on making the city center so far as possible car and bus traffic free. As a result, the bus stops on the Grote Markt, have disappeared. This is to improve the safety and attractiveness of the inner city. However this created the issue that residents who incur personal mobility problems have to walk larger distances. Respondent 8 noted, "walking distances have increased. We've done the same thing in the downtown area, of course. De Grote Markt, the bus is gone from there. And anyway, you see that we have started to make the whole downtown area more and more car-free. And that does mean that people who are really less able to walk will be at a greater distance from the facilities. And more and more people are saying that they are avoiding the city center." Its contradicting that the council removed bus stops in the city center build actually created a new parking garage at the Forum. This encourages the usage of cars and makes it more difficult for non-cars owners to access the inner city. The research of Mattioli et al. (2017) describes that in the UK households have to spend a disproportionate amounts of money on car-based mobility in order to access essential services and opportunities. According to the Ministry of Infrastructure and Water Management (2023) mobility poverty does not only exist out of financial barriers that deny people the opportunity to access work or public services. But it also exists out of fear for participating in traffic and the inability to drive or walk. From this research, in combination with already existing empirical evidence. It can be concluded that certain groups are excluded from not only economic opportunities but also social opportunities by the current transport infrastructure.

Figure 3. is a graphical illustration of the obtained results of this research. The result are categorized into three main concepts: mobility, connectivity and innovation. As explained in the methodology section the analyses focused on discovering new relationships between key variables. These discovered relationships are depicted by the lines connecting the boxes.

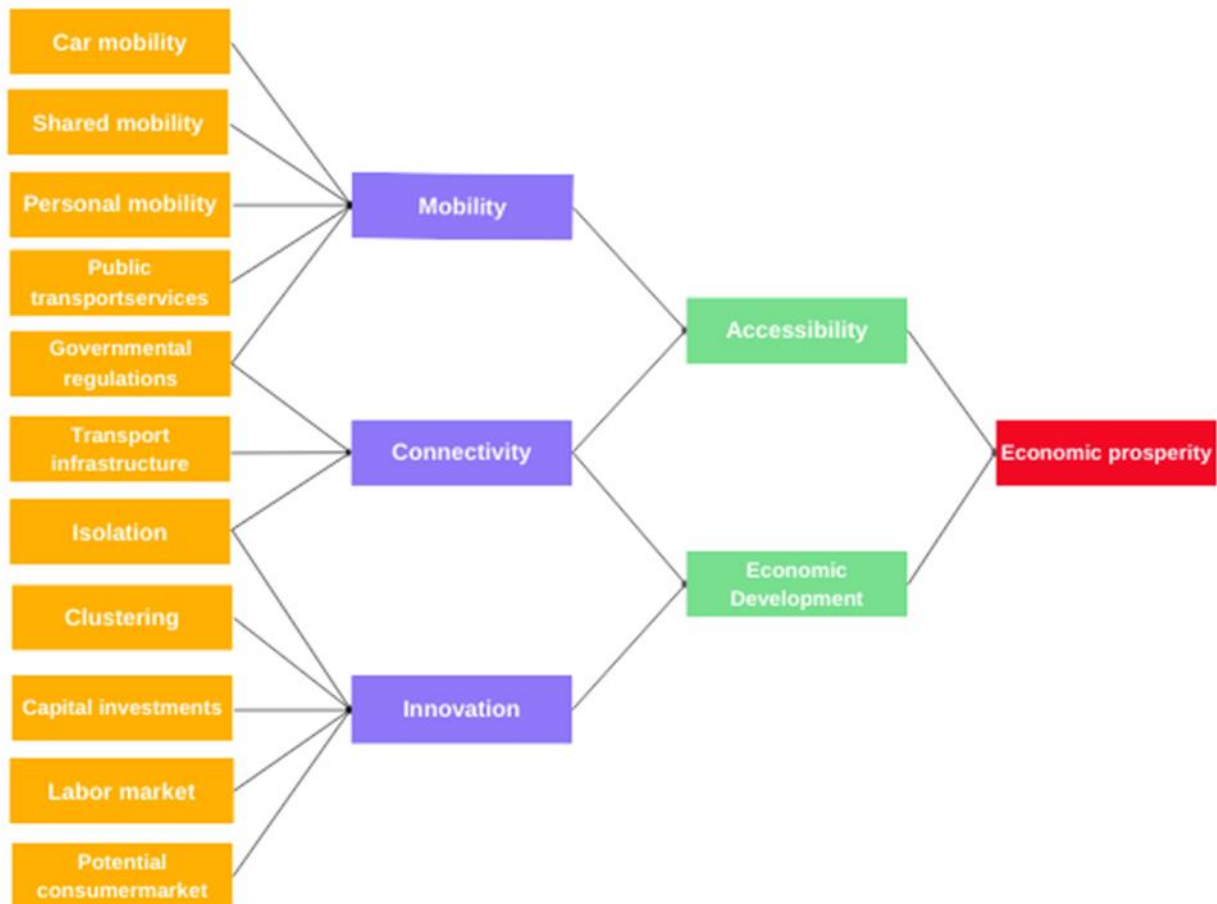


Figure 3. Theory tree

5. Conclusion

The aim of this research was to investigate how the accessibility of Groningen influences its economic prosperity. Therefore, it examined the effect of transport infrastructure on economic development, innovation and the economic opportunities it gives to diverse groups. It gathered new insights from different perspectives through a qualitative manner. The main research question of this research was: How does the accessibility of the city of Groningen affects its economic prosperity? To generate a complete answer, three sub-questions needed to be answered first. The sub-questions were: *(1) How does transport infrastructure influence economic development? (2) How does transport infrastructure influence innovation? (3) How does transport infrastructure impact the economic opportunities of diverse groups?*

Before conducting the interviews, the researcher conducted a literature review. This resulted in three expectations. Based on the literature his first expectation was that improving the quality of transport infrastructure will have a positive effect on the economic development of Groningen. His expectation was confirmed by the results. According to the results improving the quality of the transport infrastructure indeed has a positive impact on its economic development. Improving the transport infrastructure, such as building new roads and railroads, increases people's mobility, making the process of conducting economic transactions easier. An example from Groningen is the redevelopment of the Zuidelijke-Ringweg. Here a bottleneck has been removed which has improved traffic flow and road safety. Resulting in fewer traffic jams at one of the main entryways of the city. However, Groningen still remains quite isolated from major urban areas like the Randstad due to its geographical isolation. This limits her competitiveness with this type of regions however it also ensures that it of itself has many high-quality facilities that are important to the region.

The second expectation was that transport infrastructure would have a fostering effect on the innovation in the city of Groningen, resulting in more economic development. Also, this expectation was confirmed by the results. Although there is no direct relationship between the two variables, it can be said that transport infrastructure fosters innovation. This is because innovation requires high-quality interaction between people and companies. This interaction can take place between individuals but also between clusters. In Groningen, there are several small creative incubators such as a the Suikerzijde and in the Hortusbuurt. There is also a large knowledge cluster at the Zernike complex. All of these places need adequate transportation infrastructure so that the process of matching, learning and sharing is efficient.

The last expectation was that efficient transportation infrastructure with services that do not exclude vulnerable groups would have a positive influence on their economic opportunities. This last expectation was also confirmed by the research. The economic opportunities of vulnerable populations are indeed improved by an effective transportation system. Yet the transportation infrastructure in Groningen is not yet designed to integrate every group. The groups of people in Groningen who are most disadvantaged by an inadequately functioning transportation network are: people with lower incomes, the elderly, people with mobility problems and residents of rural areas. Reliable and affordable public transportation will help these groups the most. In addition, municipal decisions have caused the accessibility poverty of these groups to increase by eliminating buses from the city center but constructing new parking garages. This also contradicts the cities vision to make the city-center car-free. Higher-educated and relatively high-income people benefit the most from the creation of new rail lines. This is because the jobs of these groups, are often located near stations and because rail is a relatively expensive mode of transportation compared to car and bus. This finding should give urban planners and mobility experts more guidance in designing transport infrastructure for our future cities.

As said before this research tried to examine the relationship between accessibility and the economic prosperity of Groningen. After analyses it can be concluded that the economic prosperity of Groningen is influenced by its accessibility. Groningen's accessibility makes it less competitive than

other urban regions in the Netherlands. This is due not only to the geographic location of the city but also has to do with perceived distance. Despite that the Netherlands is a relatively small country with an overall well-developed transportation infrastructure. Certain areas such as Groningen are being perceived as remote from the perspective of someone living in the Randstad. Research in the past on perceived distance has shown that there are economic gaps between urban and rural areas. However the outcome of this research suggests that this also may exist between urban areas. Therefore the perceived distance between urban areas in the Netherlands and their relationship with economic prosperity could be a point of interest for future research.

The Isolation of Groningen however does not only bring disadvantages. In fact, the city fulfills an important hub-function for the northern provinces. Not only does it provide many economic opportunities for people from the region, it also has amenities and facilities that it might not have had when it wasn't so isolated. As a result, the city's isolation from other large urban regions can be seen as a blessing. This contradicts with empirical evidence that suggest that economic prosperity only can be achieved through making places more connected and accessible.

5.1 Limitations of the research

This research was done through a qualitative manner. The opinions and answers of respondents were processed to produce a result. To arrive at a result, the researcher had to interpret the opinions and answers, a process that can never completely exclude subjectivity. As a result, some aspects of the study may be underexposed although the researcher tried to remain as objective as possible.

In addition, the respondents themselves may also be biased because of their own interests and backgrounds. By interviewing people with different interests and views, the researcher hopes to have found the most complete and objective answer to the research question. The research was conducted under time pressure and limited resources were available, this affected the final result. The number of interviews was limited to eight. Doing more interviews would have led to a more reliable result.

Future research could focus on quantitatively measuring the effects of building new highways and railroads around and near the city of Groningen. This would allow statistical testing of the extent to which investments in transportation infrastructure contribute to economic progress.

5.2 Policy recommendations

Groningen's economic competitiveness can be improved by investing in better transportation infrastructure. A concrete example is the construction of the Lelylijn, which not only improves the connection with the Randstad but also with the region. Indeed, the towns of Drachten, Heerenveen and Emmeloord will be connected to the rail network in this plan. Creating a larger consumer and labor pool market for businesses in Groningen. This could lead to more economic prosperity because it fastens the process of matching, learning and sharing.

The national government can ensure that public transportation becomes cheaper and more available to the groups that would benefit the most from a better transportation network. These are low-income people, the elderly, people with mobility problems and residents of more rural areas. This can be done by subsidizing tickets or creating more frequent bus connections. By making public transport more accessible for vulnerable groups their ability to access economic opportunities will increase.

The final recommendation by which transportation infrastructure can be improved is to invest in shared-mobility. Shared-mobility such as shared cars and shared bicycles reduce overall car ownership and fossil fuel emissions. In addition, shared-mobility is more accessible to groups who cannot afford or drive a car. This will increase the overall welfare of the population of Groningen. There will be less congestion on the city's road networks which will allow cost savings.

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Appendix A.

Template Research Data Management Plan

Instructions: this is the template for a data management plan. Please fill this in and discuss it with your supervisor during the design phase of the thesis. If your thesis is nearly complete, please add this as an appendix to the thesis. The purpose of making a dmp to think ahead. How will you manage the data gathered for your project? It is not about providing the 'right' answers, but making your research transparent. Some items just require ticking, some require further explanation.

| | |
|---|--|
| 1. General | |
| 1.1 Name & title of thesis | Steijn Bloembergen: How the accessibility of Groningen influences its economic development |
| 1.2 (<i>if applicable</i>) Organisation. Provide details on the organisation where the research takes place if this applies (in case of an internship). | |

| | |
|---|--|
| 2 Data collection – the creation of data | |
| 2.1. Which data formats or which sources are used in the project? For example: - theoretical research, using literature and publicly available resources - Survey Data - Field Data - Interviews | Literature review before the actual research and during the research interviews. |

| | |
|--|---|
| <p>2.2 Methods of data collection</p> <p>What method(s) do you use for the collection of data. (Tick all boxes that apply)</p> | <p>Semi-structured individual interviews</p> |
| <p>2.3. (If applicable): if you have selected 'Secondary analyses on existing datasets': who provides the data set?</p> | <p>Data is supplied by the University of Groningen.</p> <p>Data have been supplied by an external party. (Please mention the party here).</p> |

| | |
|---|------------------------------|
| <p>3 Storage, Sharing and Archiving</p> | |
| <p>3.1 Where will the (raw) data be stored <i>during</i> research?</p> <p>If you want to store research data, it is good practice to ask yourself some questions: <input type="checkbox"/> How big is my dataset at the end of my research?</p> | <p>X-drive of UG network</p> |

| | |
|--|--|
| <p><input type="checkbox"/> Do I want to collaborate on the data? <input type="checkbox"/> How confidential is my data?</p> <p><input type="checkbox"/> How do I make sure I do not lose my data?</p> <p>Need more information? Take a look at the site of the Digital Competence Centre (DCC)</p> <p>Feel free to contact the DCC for</p> | |
|--|--|

| | |
|--|--|
| <p>questions: dcc@rug.nl</p> | |
| <p>3.2 Where are you planning to store / archive the data after you have finished your research? Please explain where and for how long. Also explain who has access to these data</p> <p>NB do not use a personal UG network or google drive for archiving data!</p> | <p>X-drive of UG network</p> <p>The retention period will be 1 year.</p> |
| <p>3.3 Sharing of data</p> <p>With whom will you be sharing data during your research?</p> | <p>I will not be sharing data</p> |

| | |
|--|------------|
| <p>4. Personal data</p> | |
| <p>4.1 Collecting personal data</p> <p>Will you be collecting personal data?</p> <p>If you are conducting research with personal data you have to comply to the General Data Privacy Regulation (GDPR). Please fill in the questions found in the appendix 3 on personal data.</p> | <p>Yes</p> |
| <p>If the answer to 4.1 is 'no', please skip the section below and proceed to section 5</p> | |

| | |
|--|--|
| <p>4.2 What kinds of categories of people are involved?</p> <p>Have you determined whether these people are vulnerable in any way (see FAQ)?</p> <p>If so, your supervisor will need to agree.</p> | <p>My research project involves:</p> <p>Adults (not vulnerable) \geq 18 years</p> <p>Respondents will be experts from governmental/institutional or commercial organizations.</p> |
| <p>4.3 Will participants be enlisted in the project without their knowledge and/or consent? (E.g., via covert observation of people in public</p> | <p>no</p> |

| | |
|---|---|
| <p>places, or by using social media data.)</p> | |
| <p>4.4 Categories of personal data that are processed.</p> <p>Mention all types of data that you systematically collect and store. If you use particular kinds of software, then check what the software is doing as well.</p> <p>Of course, always ask yourself if you need all categories of data for your project.</p> | <p>Name and address details</p> <p>Nationality</p> <p>Job information</p> <p>Job experience, due to the fact that people need to be an expert in their field of research.</p> |

| | |
|---|---|
| <p>4.5 Technical/organisational measures</p> <p>Select which of the following security measures are used to protect personal data.</p> | <p>Anonymisation</p> <p>Encryption of storage</p> |
| <p>4.6 Will any personal data be transferred to organisations within countries outside the European Economic Area (EU, Norway, Iceland and Liechtenstein)?</p> <p>If the research takes places in a country outside the EU/EEA, then please also indicate this.</p> | <p>no</p> |
| <p>5 – Final comments</p> | |
| <p>Do you have any other information about the research data that was not addressed in this template that you think is useful to mention?</p> | |

Appendix B

Form for transcription and audio recording

Name respondent: _____

Date: _____

Researcher/interviewer: Steijn Bloembergen

I, the respondent hereby voluntarily consent to the recording, transcription and processing of the data provided during the interview.

I also understand that:

1. The recording of the interview may be audio, video, or written notes.
2. My identity will be protected by anonymizing the data unless I explicitly consent to the use of my name or other personal information.
3. The recording of the interview will be used only by the researcher himself and will not be shared with third parties.
4. The data will be kept for a maximum time of 1 year for possible follow-up research by the researcher himself.
5. The respondent has permission to view the final research report.

Signature respondent: _____

Date: _____

Signature researcher/interviewer: _____

Date: _____

Appendix C

Semi-structured interview

Name interviewer: Steijn Bloembergen

Name respondent: x

Nationality: x

Occupation respondent: x

Date: xx-xx-2024

Location: x

Introduction:

- Ask for permission to record the conversation and explain how the data will be processed and stored;
- Personal introduction, explain research topic and goal of the interview.

Experience/background:

- Ask for a personal introduction of the respondent;
- What is your personal background? (education and job-experiences)
- Can you describe your personal experiences with transport infrastructure and economic development?

Research question 1:

- How does the quality of transport infrastructure effect economic development?
- In what ways does the efficiency of transportation networks within Groningen affect the flow of goods and services, and consequently, economic productivity?
- Have there been situations where the quality of the transport infrastructure have hindered the expansion or development from certain business or industries in Groningen?
- How could the quality of Groningen her transport infrastructure be improved, so it positively influences its economic development?
- What are potential challenges or opportunities for the infrastructure in Groningen?
- Ask for examples, explanations and advices.

Research question 2:

- How does transport infrastructure effect innovation?
- What are examples of places where innovation is fostered by improving the transport infrastructure.
- How does the transport infrastructure influence innovation in Groningen?
- Can you give an example of how this have influenced the innovation in Groningen?
- What are some specific challenges or obstacles that arise due to inadequate transport infrastructure in Groningen?
- How do these barriers hinder or impede the innovation process within the region?
- Do you have your own ideas on how innovation in Groningen can be positively influenced?
- Ask for examples, explanations and advices.

Research question 3:

- Does transport infrastructure exclude certain groups from economic opportunities?
- What kind of people or groups are this?
- How is this measured?
- What can be done to improve the situation of these groups?
- Could there be more hidden implications of a lacking transport infrastructure?
- Do you know more hidden implications?

Conclusion:

- How does the accessibility of Groningen effect its prosperity?
- What adjustments can we make in the transport infrastructure to positively influence its economic development?

Ending:

- Thank the respondent for their time;
- Make sure they sign the form for data processing.