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The effect of urbanisation on economic growth in Finland

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TIIVISTELMÄ:
Kaupungistumisen ja talouskasvun välillä on toistuvien eri maissa ja eri aikoina tehtyjen havaintojen perusteella kiistattomasti positiivinen yhteys. Siitä miten tämä mekanismi toimii, minkäsuuruinen vaikutus talouskasvuun on ja mikä on näiden välinen syy-seuraussuhde, ei kuitenkaan ole tieteellistä yhteisymmärrystä.

Tätä ilmiötä tarkastellessa on erotettava toisistaan käsitteet kaupungistuminen ja urbaani keskittyminen. Kaupungistumisella tarkoitetaan kaupunkimaisilla alueilla asuvan väestön osuutta koko väestöstä, urbaanilla keskittymisellä suurimmalla kaupunkiseudulla asuvan väestön osuutta tarkastellun maan tai alueen väestöstä. Nimenomaan urbaanin keskittymisen positiivinen vaikutus talouskasvuun on aiemman tutkimuksen perusteella selkein. Aiemman tutkimuksen perusteella on myös viitteitä siitä, että kehittyneissä maissa kausaatio on päinvastainen, eli talouskasvu kiihdyttää urbaania keskittymistä.

Suomi on tyypillinen kaupungistunut ja kehittynyt maa. Tästä huolimatta urbaani keskittymiskehitys jatkuu, viimeisen 30 vuoden aikana väestö on kasvanut pääasiassa vain 7 suurimmalla kaupunkiseudulla. Olennainen kasvavia kaupunkiseutuja yhdistävä tekijä on näillä seuduilla sijaitseva yliopisto. Samanlainen kehityskulku on havaittavissa muissa kehittyneissä maissa. Tätä on selitetty inhimillisen pääoman ja innovatiivisten tuotteiden merkityksen kasvulla moderneissa talouksissa.

Tässä työssä pyrittiin selvittämään edellä kuvatun urbaanin keskittymiskehityksen vaikutusta talouskasvuun Suomessa. Työssä käytetyssä empiirisessä mallissa tarkasteltiin Suomen maakuntien kokonaistuotannon kasvua kaikki maakunnat sisältävällä paneeliaineistolla aikavälillä 2000-2022. Tätä kasvua selitettiin urbaanin keskittymisen kasvulla. Urbaanilla keskittymisellä tarkoitetaan tässä yhteydessä maakunnan suurimman kaupunkiseudun väkiluvun osuutta koko maakunnan väkiluvusta. Kontrollimuuttujina käytettiin kiinteätä pääomaa, korkeakoulutettujen osuutta väestöstä ja tutkimus- ja tuotekehitysinvestointeja maakunnassa. Tutkimuksen motivaationa oli aiemmin mainittu havainto muutaman suurimman kaupunkiseudun kasvusta, mutta toimiva tutkimusasetelma, jossa analysoitaisiin tämän ilmiön vaikutusta talouskasvuun olisi valitettavasti ollut hyvin vaikea toteuttaa, joten asetelmaksi valikoitui maakunnista koostuvan paneeliaineiston tarkastelu.

Analyysin tulosten perusteella voidaan tehdä johtopäätös, että urbaanin keskittymisen eteneminen yleisellä tasolla edistää talouskasvua Suomessa. Analyysin puutteeksi jäi, että koulutusmuuttujan vaikutuksen suuruuden arviointi osoittautui mahdottomaksi. Analyysin yllättävä tulos oli, että urbaanin keskittymisen vaikutus Suomessa osoittautui lineaariseksi, mikä on ristiriidassa aiemman tutkimuksen kanssa.

AVAINSANAT: Economics, economic growth, urbanisation, urban concentration, economic development, human capital, productivity

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1 Introduction

In this thesis, an analysis of the impact of further urbanisation on economic growth in Finland is conducted. The motivation for investigating this question is the observation, that the main population growth and migration in Finland during the last 30 years have concentrated in the capital city and 6 of the largest cities and their surrounding urban regions (Laakso & Loikkanen 2016, pp. 21-24). This trend has been ongoing despite Finland being a developed and urbanised economy.

Another motivation for choosing this topic is similar observations of proceeding population growth in the largest cities in other developed countries, such as observations by Moretti (2013, pp. 5-7) and Nylund et al. (2022, pp. 675-677) in the United States, and the ambiguousness of the connection between urbanisation and economic growth in previous research (Henderson, 2003; Bertinelli & Strobl, 2007; Brunt and García-Peñalosa, 2022; Tamang, 2013).

No scientific consensus exists on the impact of urbanisation on economic growth. There are only empirical observations of positive correlation between these phenomena and ambiguous theories explaining that (Henderson, 2003, p. 47). The aim of this analysis is to describe how currently proceeding urbanisation and concentration of population in Finland is interacting with economic growth. Based on this theory background and these observations, the hypothesis for this analysis becomes that further urbanisation would promote economic growth. The approach chosen here is analysing a panel data of all regions in Finland during the period 2000-2022 and examining the development of output per capita at the level of these regions.

Based on literary review conducted in this thesis, examples of analysing the impact of urbanisation on economic growth at the level of a single country are relatively rare, while extensive research has been made that has focused on analysing this phenomenon on a

general level, observing a large group of diverse countries. This becomes one more motivation for choosing this approach.

In addition to being an interesting and relevant open question in the academic sense, answering this question has a substantial social impact in the real world. This phenomenon of population concentrating in a couple of the largest cities and the uneven economic development resulting from this has become a major divisive question in politics in Finland, as suggested by Pantsu (2019). In Finland, there has always been political guidance of urban and regional development, which has been justified by both solidarity and assumed economic benefits of even and equal regional development. No definitive conclusion however exists on whether these economic benefits exist, and how large are potential economic losses, as discussed by Laakso and Loikkanen (2016, pp. 71-81) and Kangasharju et. al. (1999, pp. 21-23).

Evaluating this balance of potential benefits and losses of redistributive regional policies and lower urban concentration has become even more complex now when Finland alongside other developed countries has shifted to a modern economy driven by human capital and innovation, as suggested by Nylund et al. (2022, pp. 675-677), Moretti (2013, pp. 15-33) and Koste et al. (2020, p. 5). In this situation, there is evidence of this balance shifting towards economic gains from further urban concentration, and therefore, losses from actively halting this development.

Alongside Finland, most developed countries are facing this same difficult question, how to adapt and react to this development, as suggested by Moretti (2013, pp. 15-33). This question is both politically divisive and also has a substantial economic and social impact on the people living in these disadvantaged areas that are losing population and have decreasing economic activity. This makes responding to this development difficult. The economic realities of this development have to be acknowledged, but ultimately it becomes a political choice what the social response to this development will be.

2 Urbanisation and economic growth

There is undeniable evidence of urbanisation and economic development being interlinked. Henderson (2003, p. 47) and Brunt and García-Peñalosa (2022, pp. 512-513) note that in the real world, a simultaneous increase in urbanisation and economic growth has been observed repeatedly, so a connection between these phenomena certainly exists. According to Henderson (2003, p. 47), the simple correlation coefficient between the degree of urbanisation and gross domestic product per capita across countries in different years is around +0.85.

In this chapter theory of the relationship between urbanisation and economic growth is presented. First, the concept of urbanisation itself is defined. Then, theoretical mechanisms on how urbanisation promotes economic growth are presented. After that, empirical observations of the relationship between urbanisation and economic growth across various countries at various moments in history, the impact of urban density, and observations of this effect in modern innovation-driven economies are presented. At the end of this chapter, conclusions on the effect of urbanisation on economic growth are summarised.

2.1 Urbanisation

Urbanisation as a concept means an increase in the share of the population living in cities (OECD, 2020, pp. 25-38). Despite being a simple concept, no universal definition of urbanisation exists. This means that reliable comparison of degrees of urbanisation between countries is difficult, as these numbers are produced by national authorities who use varying definitions for this measure (Henderson, 2003, pp. 65-66; OECD, 2020, pp. 27-29). OECD (2020, pp. 25-38) has proposed a common definition for the degree of urbanisation. In this thesis, the definition for the degree of urbanisation is the one used

by Statistics Finland (2024a), which is the proportion of people living in urban settlements. An urban settlement is defined by Statistics Finland (2024b) as follows:

> An urban settlement is a cluster of buildings with at least 200 inhabitants. Urban settlements are defined and delimited by the Finnish Environment Institute using geographic information methods that utilise the building and population data of Statistics Finland's 250 m x 250 m grid data. The population size of grids containing buildings and their neighbouring grids, as well as the number of buildings and their floor area, are reviewed in the definition. From the uniform clusters of dwellings generated in the definition, the ones with at least 200 inhabitants are selected. Administrative regional divisions do not affect the formation of urban settlements, and urban settlements do not follow municipal boundaries.

In their research regarding the causality between urbanisation and economic growth, both Henderson (2003) and Bertinelli and Strobl (2007) use urban concentration rather than the degree of urbanisation as a measure for urbanisation. The reason for this is, as Henderson (2003, p. 49) suggests, that productivity growth is affected by increasing urban concentration rather than the degree of urbanisation itself. The measure of urban concentration used by them is urban primacy, the degree of population living in the largest urban area in a country (Bertinelli & Strobl, 2007, p. 2502; Henderson, 2003, p. 67).

2.2 Theoretical mechanisms

Evidence of the possibility of both urbanisation promoting economic growth and vice versa exists. Various theoretical explanations for these phenomena exist. One explanation for urbanisation promoting economic growth is proposed by Duranton, and Puga (2004). They suggest that there are mechanisms called "agglomeration economies" (Duranton, and Puga, 2004, pp. 1-3) linked to urbanisation, that promote economic growth. They define these mechanisms as "sharing, matching and learning" (Duranton, and Puga, 2004, pp. 1-3).

The mechanism of sharing means that a larger population in a city can share goods that they do not have to possess themselves, which creates efficiency (Duranton & Puga, 2004, pp. 3-22). Residents in a city can share indivisible goods, public goods, public infrastructure and a common marketplace. Sharing a common marketplace makes specialisation in producing and consuming a variety of goods and services possible. One especially important aspect in facilitating specialisation is creating a marketplace for intermediate goods produced by one firm and used by another in their production. This aspect is especially important in explaining the growth of a city, as typically, it is most efficient to use these intermediate goods close to the other firm they were produced by. Kim et al. (2016, p. 4) confirm that appropriate infrastructure facilitates the efficient allocation of goods and resources.

The mechanism of matching means that efficient allocation of goods and services between producers and consumers, and efficient allocation of workers and employees becomes possible (Duranton & Puga, 2004, pp. 22-35). This improves the specialisation of firms and workers, as workers have more possibilities to specialise in a variety of different skills and firms have demand for this larger variety of skills and the possibility to compete in hiring the most skilled workers.

The mechanism of learning means increasing the skills and expertise of the population both by institutional education, but also through frequent interaction of people with a large variety of skills and the creation of new ideas through these interactions (Duranton & Puga, 2004, pp. 35-47). This mechanism based on frequent interaction of people is especially emphasised by Glaeser (1994, pp. 19-21, 22-25) and Brunt and García-Peñalosa (2022, pp. 525-529).

The possibility of the causation running in another direction, economic growth promoting urbanisation is proposed by Krugman (1998, pp. 8-9). He suggests that urbanisation is a result of an equilibrium between centralising and decentralising forces. Urbanisation is initiated by an increase in returns to scale in production, an increase in the proportion

of production and consumption of industrial goods in the economy and a decrease in transportation costs (Krugman, 1991, pp. 16-22).

The increase in productivity and the economic prosperity this provides is one centralising force. A variety of decentralising forces can play a role, the most common are costs of crowding and increasing cost of living. Additional forces that are observed to hinder or increase the willingness of people to move to a city can be examined in an analysis of urban growth. Krugman (1998, pp. 8-9) suggests that changes in the relative magnitude of these forces change the equilibrium and dictate whether the population of a city grows or not.

Henderson (2003, pp. 57-61) suggests that an optimal degree of urban concentration for a country may exist. Urban concentration can be either too low or too high for a country, and this deviation can cause a loss in productivity. According to Henderson (2003), country and population size affect the optimal level of concentration, the optimal level of concentration is lower for countries with a larger area and population.

Urban concentration can be too high when costs of over-urbanisation, “exhausted scale economies, excessive congestion, and excessive per capita infrastructure costs” (Henderson, 2003, p. 52) offset the productivity gains from urban concentration. Duranton, and Puga (2004, pp. 10-12) conclude that an optimal size for a city can be defined, where productivity gains from agglomeration economies and congestion costs are balanced. According to them, this optimal size is defined by how specialised the production in a city is. As Duranton and Puga (2004, p. 11) state: “efficient size is larger for cities specialised in sectors that exhibit greater aggregate increasing returns”. The explanation for this is that the costs of urban crowding for residents have to be offset by higher wages.

Duranton and Puga (2004, p. 8) further describe the effect of city size as follows, a city can be examined consisting of a “central business district”, where production is located, and an area that surrounds it, where residences are located. Costs of living are higher

closer to the central business district and costs of commuting are higher further away. Residents choose their location by optimising between the cost of living and commuting costs. This suggests that urban planning, dense housing and efficient transport infrastructure can play a role in productivity growth in a city, by minimising commuting costs and costs of living. The importance of city structure is further discussed in the next chapter.

2.3 Empirical evidence

The relationship between urbanisation and economic growth has been studied extensively in the field of economics, but so far, no scientific consensus on the exact effect and causality between these phenomena has been found (Henderson, 2003; Bertinelli & Strobl, 2007; Brunt and García-Peñalosa, 2022; Tamang, 2013). Krugman (1998, pp. 7-8, 10) notes that considering the importance of this relationship and its observable effect in the real world, it has been studied surprisingly little though.

Despite universal observations of urbanisation and economic growth co-occurring as emphasised by Henderson (2003, p. 47) and Brunt and García-Peñalosa (2022, pp. 512-513), in several cases throughout history, urban growth has occurred with no economic growth occurring simultaneously. According to Brunt and García-Peñalosa (2022, p. 513), the urban population in Europe had already increased in the 1700s before the Industrial Revolution. Bertinelli and Strobl (2007, p. 2499) and Tamang (2013 p. 45) note, that a similar phenomenon has been observed in developing countries today. In many instances, urban growth has happened without simultaneous or preceding economic growth. It is therefore the exact definition and causality of this effect between urbanisation and economic growth that has not been solved.

Conclusions in different directions of causality have been made, as Brunt and García-Peñalosa (2022, p. 512) note. Some research suggests that urbanisation itself is a factor

generating economic growth, other research suggests that urbanisation is just a consequence of an economy growing. Brunt and García-Peñalosa (2022, pp. 541-542) suggest that urbanisation itself is a factor promoting economic growth.

Tamang (2013, p. 43) suggests that the causality of this relationship differs between developing and developed countries. In the case of developing countries, an increase in urbanisation seems to promote economic growth, and in the case of developed countries, an increase in economic growth seems to lead to an increase in urbanisation. Henderson (2003, p. 50) and Bertinelli and Strobl (2007, pp. 2502-2506) also suggest that the effect of urbanisation on economic growth is different between countries in different phases of development and their degree of urbanisation.

The developed countries Bertinelli and Strobl (2007, p. 2508) examined were Australia, Austria, Belgium, Canada, Denmark, Finland, France, West Germany, Greece, Ireland, Israel, Italy, Japan, South Korea, Kuwait, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, United Kingdom, United States, and the developing countries were Algeria, Argentina, Bangladesh, Bolivia, Brazil, Cameroon, Chile, China, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Ghana, Guatemala, Haiti, Honduras, India, Indonesia, Iran, Iraq, Jordan, Kenya, Malaysia, Mali, Mexico, Mozambique, Myanmar, Nicaragua, Pakistan, Panama, Paraguay, Peru, Philippines, Senegal, South Africa, Sudan, Thailand, Tunisia, Turkey, Uganda, Uruguay, Venezuela, Zaire.

The developed countries Tamang (2013, pp. 43-45) examined were Belgium, Canada, Denmark, France, Greece, Iceland, Israel, Japan, Norway, New Zealand, Portugal, Sweden, and Switzerland, and the developing countries were Algeria, Argentina, Chile, Colombia, Egypt, Guatemala, Malaysia, Mexico, Morocco, Nigeria, Paraguay, Peru, Sri Lanka, Zambia.

Bertinelli and Strobl (2007 pp. 2502-2506) suggest that an increase in urban primacy seems to be a factor contributing to economic growth. This effect however seems to end

when the degree of urbanisation measured by urban primacy reaches 40 % (Bertinelli & Strobl, 2007, pp. 2502-2506), and in the case of developing countries, urban primacy exceeding this value seems to be harmful for the growth of the economy. Bertinelli and Strobl emphasise though, that this number contains great uncertainty and should be viewed as only a rough estimate. In his similar analysis, Henderson (2003, p. 61) concluded that in 1990, 55 per cent of the sample of countries analysed were above, 41 were below, and the rest were next to the optimal level of urban primacy.

For developing countries with a low degree of urbanisation though, an increase in urban primacy seems to be a factor contributing to economic growth. Bertinelli and Strobl (2007, pp. 2499-2501) add that in the case of developing countries, urban planning that aims to alleviate the costs of over-urbanisation and unhealthy living conditions in growing cities is important for the economic benefits of urbanisation to be realised.

2.4 Urban structure

In addition to the degree of urbanisation and urban concentration, population density and geographical structure of urban areas is a factor affecting the economic efficiency of these areas. This effect can be seen both in the economic productivity in these areas, as discussed before, but also in public finance. According to Prieto et al. (2015, pp. 812-813), higher population density of urban areas means lower costs of infrastructure and public services. Findings by Hietala and Jauhiainen (2013, pp. 17-22) confirm this. Prieto et al. (2015, pp. 809-814) suggest that the optimal population density for minimising production costs is around 3500 inhabitants per square kilometre, densities above this threshold do not improve efficiency anymore (Prieto et al., 2015, p. 814).

According to Prieto et al. (2015, p. 813), the effect of population density can be defined in “spatial density economies” and “vertical density economies”. Spatial density economies are defined as dispersion and connections between urban clusters and vertical

density economies as population density within these clusters. They suggest that these effects are complementary, but spatial density economies are more important. Therefore, policies aiming at reducing urban sprawl with several dispersed distant urban clusters are most efficient in increasing the efficiency of urban areas and decreasing the costs of this development.

2.5 Urbanisation in modern innovation-driven economies

According to Moretti (2013, pp. 15-33), there is a major structural shift happening in the economies of developed high-income countries, where the share of industrial manufacturing has decreased, and the importance of innovation, human capital and digital services has increased. Moretti (2013, p. 37) claims that this development has begun in the 1980s. In this development, demand for academically educated high-skilled workers increases. These people working in research and development creating and providing unique services and products generate the main portion of wealth in the economy. This notion is supported by Kim et al. (2016, pp. 1-2), who suggest that collaboration between academic institutions and industries and the provision of high-quality education are powerful improvers of productivity.

The other main portion of the economy according to Moretti (2013, pp. 26-33) consists of providing the services demanded by these people. These services employ those workers who are not academically educated, and who would have previously worked in conventional manufacturing industries. These services are provided close to the consumers, in the cities where these educated workers live.

This development favours proportionally large cities with universities. Moretti (2013, p. 7) claims that as a consequence, smaller cities with a population with a lower education level experience a loss in population and economic prosperity. According to Moretti (2013, p. 7), cities with both conventional manufacturing industries and academic

institutions and a pool of academically educated workers have an opportunity to develop in either direction, they might either develop into a growing economy driven by innovation, or they might regress into a city with declining economic activity and increasing rate of unemployment.

Nylund et al. (2022, pp. 675-677) suggest that in a modern innovation-driven economy, centres of urban areas, usually city centres, are where new growing enterprises aim to be located. In these locations, these enterprises have easy access to other firms to compete or collaborate with, academic institutions and a large pool of consumers. In these circumstances, enterprises have the best possibilities to experiment with different products and business models in a "living lab manner" (Nylund et al., 2022, p. 670). More conventional industries on the other hand tend to be located in more remote areas. Kim et al. (2016, pp. 3-4), confirm, this notion that the "creative destruction" of competing firms experimenting with different products improves productivity.

When an economy is more based on these types of experimental innovation-driven industries, as is the case currently with developed economies, and when proceeding globalisation intensifies competition between cities and nations, the importance of large dense cities grows. In their analysis, Nylund et al. (2022, pp. 675-677) discover that a remarkable rapid shift of entrepreneurial activity to urban centres has happened around 2010. A simultaneous phenomenon occurring at that time has been the emergence of mobile applications and business models based on digital platforms, although they do not manage to confirm the impact of these technologies on this development.

2.6 Conclusions on the relationship between urbanisation and economic growth

As described before, despite extensive past research, the relationship between urbanisation and economic growth has not been solved. Evidence of the causality going both

directions, urbanisation promoting economic growth and vice versa exists, both under- and over-concentration of urban population may have a harmful effect on the economy. Urbanisation may promote economic growth in the case of developing countries, and economic growth may promote urbanisation in developed countries. In the case of developed countries, a threshold of urban primacy may exist, where exceeding this value does seem to neither promote nor decrease economic growth. All these predictions contain remarkable uncertainty.

The mechanism of urbanisation promoting economic growth is mainly explained by a larger pool of people being able to share their skills and ideas with each other, a larger marketplace making specialisation possible and residents being able to share indivisible goods. These mechanisms seem to become more important as the developed economies are increasingly relying on human capital and innovative products. An additional aspect to this question is that the economic benefits of urbanisation are larger when a city is dense and interconnected enough so that interactions between a larger pool of people become possible and resources invested in infrastructure are used efficiently.

This role of human capital in modern economies is expected to be an explanation for the notion that urban concentration is still proceeding in developed urbanised countries, which seems counterintuitive considering the theories predicting that the benefits of urbanisation will diminish the more urbanised and developed a country is.

3 Urbanisation in Finland

As past research regarding the relationship between urbanisation and economic growth discussed before suggests, an increase in urbanisation in Finland measured by the degree of urbanisation likely won't be a remarkable factor contributing to economic growth, as Finland is a developed and urbanised country. There are however factors linked to the urban structure in Finland which can have an impact on economic growth.

The nature of further urbanisation and its economic impact might be captured by the measure of urban primacy, as the development of the capital city region and other large cities growing is still proceeding (Laakso & Loikkanen, 2016, pp. 20-24; Statistics Finland, 2024d), and the degree of urban primacy is still slightly under the 40 % predicted by Bertinelli and Strobl (2007, p. 2506). The degree of urban primacy in Finland in 2023 measured by population in the urban area of the sub-regional unit of Helsinki divided by the national population was 29.32 % (adapted from Statistics Finland, 2024d).

Research focusing both specifically on the situation in Finland and on other comparable developed countries suggests, that an economy developing towards an information-intensive service economy tends to benefit from a certain type of urban geography (Nylund et al., 2022, pp. 675-677; Moretti, 2013, pp. 23-24). An urban geography with large urban areas close to each other both in terms of distance and transportation connections seems to be an increasingly important factor contributing to economic productivity.

This has implications for the urban structure in Finland. Finland is a developed urbanised economy, the degree of urbanisation in Finland was 85.77 % in 2023 (World Bank, 2024c), or 73.0 % as defined by Statistics Finland (2024d), but the urban structure has some specific characteristics worth observing. These factors are the low population density of urban areas, urban areas having long distances between each other and the existence of several urban areas with a small population (Laakso & Loikkanen, 2016, p. 22; Niiranen

& Eskelinen, 2003, p. 47; Koste et al., 2020, p. 8). Koste et al. (2020, p. 8) predict that this urban structure of long distances between cities can be a hindrance to productivity growth, which is relatively larger compared to other developed countries.

In this chapter, the history of urban development in Finland is described, the importance of universities in this development today is presented, the political guidance affecting urbanisation and regional development is evaluated and in the last section, conclusions on the urbanisation development in Finland are summarised. When urban areas of Finland in this work are analysed quantitatively, they are measured in sub-regional units ("seutukunta"), a unit defined by Statistics Finland (2024c), unless stated otherwise.

3.1 History of urban development in Finland

To illustrate the development of urbanisation and the economy of Finland, figures describing both the development of rate of the degree of urbanisation for the period 1960-2023 (adapted from World Bank, 2024c) and real gross domestic product per capita in US dollars for the period 1960-2023 (adapted from World Bank, 2024a) are presented in Figures 1 and 2 below. To illustrate the rate of urbanisation in Finland relative to some comparable developed countries, degrees of urbanisation for Finland, Sweden, Germany, United States, United Kingdom, Japan, and the global average degree of urbanisation in 2023 are presented in Table 1 below (adapted from World Bank, 2024b).

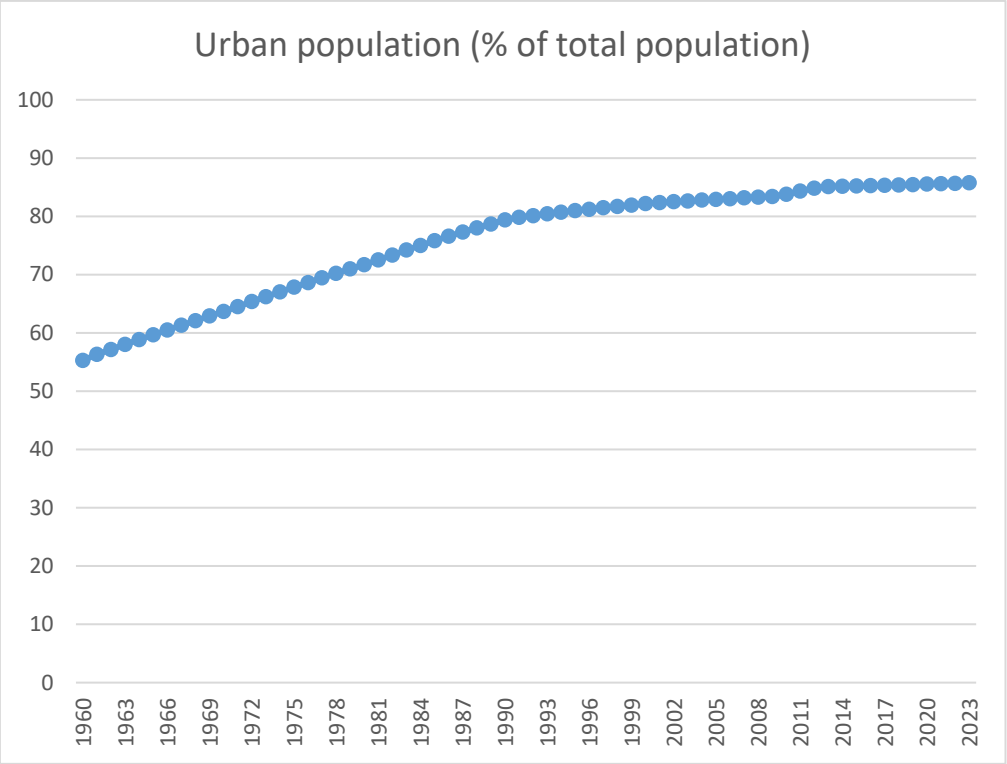

Figure 1: Rate of urbanisation in Finland 1960-2023 (adapted from World Bank, 2024c).

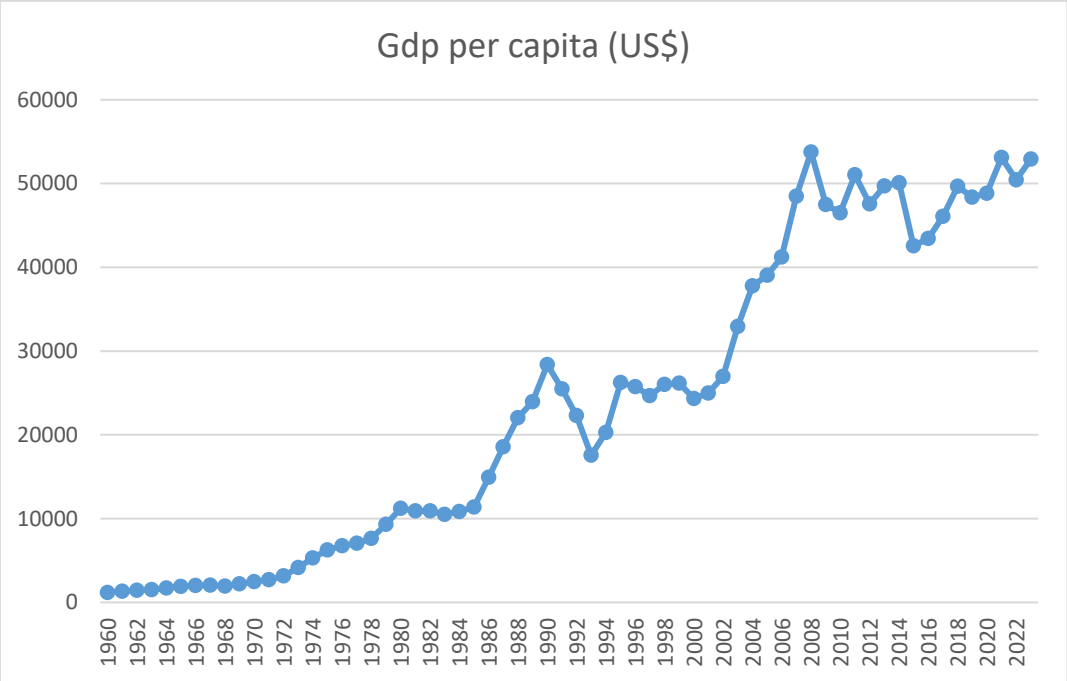

Figure 2: Gross domestic product per capita in Finland 1960-2023 (adapted from World Bank, 2024a).

Table 1: Degree of urbanisation in various countries in 2023 (adapted from World Bank, 2024b).

Country	**Degree of urbanisation (%)**
World	57
Finland	86
Sweden	89
Germany	78
United States	83
United Kingdom	85
Japan	92

Heikkilä (2003, pp. 52-59) has observed, that the urban development in Finland has progressed through cycles, where certain type of development has at some point reversed and then progressed again. This pattern of development called “differential urbanisation” (Geyer & Kontuly, 1993, pp. 164-166) has been observed in other developed countries at different stages of their urbanisation.

Heikkilä (2003, pp. 52-59) describes the urbanisation development in Finland as follows. In the first phase in the 1940s, the capital city, Helsinki was the region where most of the population growth occurred. Then, the largest population growth shifted to middle-sized cities in the 1960s. After that, in the 1980s, the growth in cities had stopped and small towns and rural areas gained most of the population growth. And finally, the cycle started again around the beginning of the 2000s and Helsinki and the surrounding urban region gained the most population growth (Heikkilä, 2003, p. 56)

Despite these occasional reversals of the migration trend, Heikkilä (2003, p. 54) suggests that the consequence of this development as a whole has been concentration of the population in cities, spread of urban areas and population growth in the commuting zones around cities, the most peripheral rural areas losing population, and population

as a whole concentrating in the most densely populated southern and western parts of the country.

According to Laakso and Loikkanen (2016, pp. 21-24), in the last 30 years, the main population growth has occurred in Helsinki region and 6 of the largest urban regions. As of 2023, the 7 largest urban regions, Helsinki included, were the urban regions of Helsinki, Tampere, Turku, Oulu, Lahti, Jyväskylä and Kuopio (Statistics Finland, 2024d). The 8 urban regions that had experienced highest population growth between 1993-2023 on average were Oulu, Helsinki, Tampere, Ålands landsbygd, Jyväskylä, Turku, Porvoo and Kuopio, (adapted from Statistics Finland, 2024d). These figures are presented in Table 2 below. The urban region of Ålands landsbygd was among these urban regions but should be considered an outlier due to its small population and geographically isolated location. Growth figures of all urban areas during the period 1993-2023 are presented in Appendix 2 (adapted from Statistics Finland, 2024d).

Table 2: 8 Urban areas with highest population growth 1993-2023 (adapted from Statistics Finland, 2024d).

Urban area	**Population growth (%)**
SK171 Oulu	53 %
SK011 Helsinki	41 %
SK064 Tampere	40 %
SK212 Ålands landsbygd	36 %
SK131 Jyväskylä	31 %
SK023 Turku	26 %
SK015 Porvoo	16 %
SK112 Kuopio	15 %

Niiranen and Eskelinen (2003, pp. 46-47) note that the phase of economic development has played a role in where urban areas have formed in Finland, and current economic

development is shaping this urban structure. During the period when the economy was based on manufacturing industries, urban areas emerged in areas where access to resources and transportation infrastructure was optimal for industrial plants. This usually meant formation of several smaller distant urban areas. As the economy began to develop towards an information-intensive service economy and the amount of industrial production decreased, this urban structure was not ideal and a change towards migration to the largest cities and urban areas began around the 1960s (Niiranen & Eskelinen, 2003, p. 46).

According to Niiranen and Eskelinen (2003, pp. 46-47), one especially difficult disadvantage to some urban areas especially in Eastern Finland is that they were formed during a period when transportation of goods and materials happened mainly via waterways. When transportation shifted to railways and roads, these areas were suddenly in severely disadvantageous geographical locations, as waterways were now obstacles to transportation of goods and people. Niiranen and Eskelinen (2003, pp. 46-47) claim that the path dependency created by this historical accident still affects the situation of these areas.

Niiranen and Eskelinen (2003, pp. 53-54) note that especially in the case of Eastern Finland, urban geography poses also other disadvantages to economic prosperity. The area consists of relatively small urban areas with long distances and travel times between each other. The consequence of this is, that these urban areas do not form larger functional urban areas that could create economies of scale. It is therefore not surprising, that the whole area of Eastern Finland is currently losing its population in net migration and performs worse in terms of economic output compared to the average of the whole country (Niiranen & Eskelinen, 2003, pp. 49-53).

Some characteristics worth noting in the case of Eastern Finland are, that the differences in economic output and loss of population relative to the national average are smaller in larger cities in the area and in the southern part of this area which is both more densely

populated and closer to the densely populated Southern part of Finland (Niiranen & Eskelinen, 2003, p. 51). Niiranen and Eskelinen (2003, p. 54) suggest that this is an indication of a similar phenomenon at the level of the whole nation, larger cities and densely populated areas possibly being more productive.

Tervo (2016, pp. 100-105) notes that from the 1990s on, migration to the largest cities has been driven more by people wanting to live in the cities due to the amenities and environment these cities offer. There have been varying views on which factors drive people to migrate to cities, people following jobs or jobs following people. During the study period 1990-2010 in Tervo's (2016, pp. 105-106) research, migrating to cities was driven mainly by companies and jobs being located in those cities. During this period though, companies were more often than before moving to large cities due to their growing pool of employees and consumers. According to Tervo (2016, pp. 105-106), both of these mechanisms had an impact, and a specific characteristic of this trend was jobs following educated people to cities, and then less educated people following the jobs created in growing cities. This type of development is also characterised by Moretti (2013, pp. 15-33).

Koste et al. (2020, pp. 9-10) add that the modern digital platform service economy requires a large pool of consumers to operate most profitably. This happens most naturally in large urban areas, so an economy more based on these types of services, and the consumers' demand for these services is another major driver for further urbanisation in Finland. Additionally, workers are switching jobs more often now, which means that it is more ideal for them to live in an area, where more firms are located and seeking new jobs is more efficient, again, in large urban areas. Developing digital communication technologies and increasingly common remote working have sometimes been predicted to lead to a reversal of urbanisation, but according to Koste et al. (2020, p. 9) and Nylund et al. (2022, p. 665, pp. 672-677), there is little evidence of that. Instead, the importance of face-to-face meetings seems to even have increased.

Koste et al. (2020, p. 7) add that new larger interconnected functional urban areas have been formed in densely populated areas in Finland, as previously separate urban areas have grown, and transport connections have improved. They predict that this development will continue around large cities between outer urban areas forming new commuting zones, rather than directly between this central city and surrounding urban areas.

As described in this chapter, there is a remarkable change in urban structure occurring in Finland. A couple of the largest urban areas are growing in population while smaller and middle-sized cities and urban areas are losing population. This is not for the most part visible as a change in the degree of urbanisation as people are mainly moving between urban areas, but is nevertheless a remarkable change in urban structure (Laakso & Loikkanen, 2016, pp. 19-23).

3.2 The role of universities

One aspect of the urban structure in Finland is, that the growing urban regions mentioned before are also regions where a university is located (Laakso & Loikkanen, 2016, p. 20). Among these are cities and regions with a smaller population. The cities where a university was located in 2024 were Espoo, Helsinki, Joensuu, Kuopio, Jyväskylä, Rovaniemi, Lappeenranta, Oulu, Tampere, Turku and Vaasa (Ministry of Education and Culture, 2024a). Additionally, there are academic units called “university consortiums” (yliopistokeskus) in Kajaani, Kokkola, Lahti, Pori, Mikkeli and Seinäjoki (Ministry of Education and Culture, 2024b). In the following tables 3 and 4, the urban area populations in these cities are presented. Espoo, where a university is located is included in Helsinki sub-regional unit (Statistics Finland, 2023).

Table 3: Cities with a university and urban area population (Statistics Finland, 2023).

Cities with a university	**Urban area population**
Helsinki	1 642 836
Tampere	435 377
Turku	346 644
Oulu	262 736
Jyväskylä	191 187
Kuopio	145 311
Joensuu	127 306
Vaasa	110 163
Lappeenranta	88 087
Rovaniemi	68 885

Table 4: Cities with a university consortium and urban area population (Statistics Finland, 2023).

Cities with a university consortium	**Urban area population**
Lahti	204 479
Seinäjoki	131 808
Pori	128 629
Mikkeli	68 302
Kokkola	53 541
Kajaani	50 988

In addition to these, in several more cities schools called “University of Applied Sciences” (ammattikorkeakoulu) are located. In 2024, there were 22 of these schools operating in Finland (Ministry of Education and Culture, 2024c). Today, these schools also play a role in contributing to research and development based on academic research with local enterprises, even though they are strictly not universities (Maxenius, 2023).

Hosting a university can be an explaining factor to their population development as suggested by Moretti (2013, p. 7) and Nylund et al. (2022, pp. 675-677). Similar development has been observed in Sweden, as investigated by Andersson et al. (2009). In Sweden, several new universities were founded in smaller cities in 1977 and Andersson et al. (2009, pp. 7-10) discovered that productivity in the urban areas of these cities was improved as measured by output per worker and number of patents awarded. They predict that this effect is carried out by both the research and education conducted by these universities and their cooperation with local enterprises, but were not able to quantify that effect.

3.3 The role of regional policies

What is also worth noting concerning the urbanisation development in Finland is how it has been taken into account in politics, as political measures can either accelerate or hinder this development or simply let it proceed with no disturbance.

The urbanisation development characterised before is currently a major theme in politics in Finland. According to Pantsu (2019), 57 % of the people surveyed in Finland agreed with the view that the government should actively curb urbanisation, 34 % agreed with the view that the government should not intervene with this development in either direction and 2 % agreed with the view that the government should support urbanisation with active policy measures. These stances varied greatly depending on the political party the respondents supported.

The major field of policies intervening with the economic conditions in different regions, which has an impact on the migration movements among regions, is regional policies. According to Kangasharju et al. (1999, pp. 10-13, 15-17), there are various ways to define regional policies. There are various policies that actually redistribute wealth or support economic activity across regions, but do not have an implicit purpose of regional

development. These policies are usually called “wide regional policies” (suuri aluepolitiikka) (Kangasharju et al., 1999, p. 11). These policies are mainly transfer payments via social security and public services. Kangasharju et al. (1999, p. 22) note that establishing new schools and universities in smaller towns is one example of these types of development policies, which can have remarkable benefits to the local economy, as also suggested before by Andersson et al. (2009). “Actual regional policies” (varsinainen aluepolitiikka) (Kangasharju et al., 1999, p. 11) then have an implicit legal aim to support worse-performing regions economically and influence the geographical structure of the population. The economic performance of a region is typically measured by output per capita and degree of unemployment.

Kangasharju et al. (1999, p. 2) note that regional policies usually have a purpose based on both solidarity and economic benefits. The purpose of solidarity is to distribute wealth generated on the level of the whole national economy more evenly between regions when some regions generate more wealth than others. Additionally, economic gains from this redistribution are possible. This can happen when policies supporting regions succeed in making the residents in these regions able to create new profitable economic activity, or when these policies are able to reduce the costs of rapid, large-scale migration movements (Kangasharju et al. 1999, pp. 2-10). Kangasharju et al. (1999, p. 33) emphasise that redistributing policies are ultimately decided politically, and political support for these policies exists.

Kangasharju et al. (1999, pp. 3-7) explain that the costs of rapid migration movements come from the need to build new housing and infrastructure for new residents in large cities, and rising unit costs for services and infrastructure in areas losing population, as these services and infrastructure have sunken costs despite being still technically usable, so there is a loss of efficiency when they are used by a smaller amount of people. Another factor adding to these costs is that there might be also larger public cost on services and social support needed for these areas in a situation of massive migration out of these areas (Kangasharju et al., 1999, pp. 3-7). People moving out typically are

younger and more educated, so as a consequence of this change, these areas have even fewer possibilities to support themselves by profitable economic activity and instead need more public support for their services and for social benefits for the people unable to employ themselves.

These areas with high out-migration typically have high unemployment rates according to Kangasharju et al. (1999, pp. 7-10), so people moving out may have a two-way effect. People moving away on the other hand means less competition at the local job market. When people moving out are also unemployed, this can be beneficial for everyone if the people moving have better possibilities to find a job elsewhere. But on the contrary, especially in a case when the people moving are young and educated, as the case currently is, this may seriously harm the possibilities of profitable economic activity in these areas.

Therefore Kangasharju et al. (1999, pp. 7-10), conclude that it may be beneficial to actively halt this migration if doing so leads to these areas being more capable of supporting themselves, as increasing social benefit costs in these areas can be even more costly. What needs to be considered though, is whether this type of policy is cost-effective and whether it harms the possibilities of economic growth elsewhere. Additionally, Kangasharju et al. (1999, p. 32) remind that there is an actual potential threat of economic activity moving to another country, if the largest most productive cities are not allowed to grow and prosper. There is very little existing research on this matter, so it is difficult to conclude what kind of policy measures are effective in supporting these areas and is beneficial to the national economy as a whole (Kangasharju et. al., 1999, pp. 21-23).

Laakso and Loikkanen (2016, pp. 71-81) present another perspective on this question. They note that the emphasis on regional policies regarding urbanisation has varied during their history. The emphasis has shifted from first actively trying to counteract urbanisation during the first stages of urbanisation in the 1950s, to gradually not actively trying to stop urbanisation, but trying to make the development more even in different regions by redistributing income and locating production and public institutions in different

regions. What has been missing from the regional policies in Finland according to Laakso and Loikkanen (2016, pp. 71-81) though, is recognising the role of growing urban areas as drivers of economic growth and creating policies that support or at least won't prevent this growth.

According to Laakso and Loikkanen (2016, pp. 27-30), economic regional divergence in terms of some urban areas gaining and some losing population has actually resulted in decreasing differences in incomes between these regions. Some of this is due to regional policies redistributing wealth, so they conclude that this urban growth actually promotes economic growth, which benefits the whole country, while policies aiming to counteract this development may result in less national income. This will harm both the growing urban areas and the areas with decreasing population. In conclusion, regional policies aiming to counteract this urban development may be strictly harmful to the economy of the whole country.

One of the most impactful restrictions for urban development in Finland imposed by policies according to Laakso and Loikkanen (2016, pp. 36-51) are zoning policies. They have observed that zoning policies in Helsinki, the capital city and largest city in Finland, have failed to support the growth of the city and surrounding urban area. The zoning of new residential areas has been consistently too low to meet the demand for housing and building dense housing in the city centre has been restricted. This has resulted in a low-density sprawl of the urban area and a rising cost of housing in the whole urban area as the higher demand and cost of housing has shifted further away from the city centre.

To illustrate the state of urban density in Finland, population density in the city of Helsinki and the larger urban area of Helsinki, the sub-regional unit of Helsinki, could be examined. The argument by Prieto et al. (2015, p. 814) was that optimal population density for the best economic efficiency of a city is around 3500 inhabitants per square kilometre, and population density in the city of Helsinki was 3144.4 inhabitants per square kilometre and in sub-regional unit of Helsinki it was 320.7 inhabitants per square

kilometre in 2023 (adapted from Statistics Finland, 2024d). As is evident, urban density in the urban area of Helsinki is well below this threshold, and in the city of Helsinki, barely reaching it.

A higher cost of housing leads to the growth of the city slowing down. Lower population density means less access to a wider amount of jobs and services and interaction with a smaller number of people. Loikkanen and Laakso argue that this results in lower productivity. This argument is confirmed by Duranton and Puga (2004, pp. 35-47), Glaeser (1994, pp. 19-21, 22-25) and Brunt and García-Peñalosa (2022, pp. 525-529), who argue that one source of productivity in cities is the possibility of interaction with a large number of people with a wide variety of expertise and ideas.

In contrast, Laakso and Loikkanen (2016, p. 58) present Germany as an example of a country that has implemented successful urban policies. Germany has experienced a similar development with its largest cities and urban areas growing, but due to their policies not creating similar restrictions to this development, their cities have managed to grow while maintaining a lower cost of housing.

Findings by Hietala and Jauhiainen (2013) add another contribution to this discussion of the economic impact of urban geography. Their findings in Finland suggest that the main costs of low-density dispersed settlements for the municipal economy come from construction and operating costs of infrastructure (Hietala & Jauhiainen, 2013, p. 5). This is supported by findings by Prieto et al. (2013, pp. 812-813). Dispersed settlement is defined in this research by Hietala and Jauhiainen (2013, p. 5) as a settlement in an area not zoned by the municipality.

According to Hietala and Jauhiainen (2013, pp. 18-22), the costs of providing legally obliged public services in these areas have not been studied extensively, but there is evidence that the cost difference compared to services in densely populated places is relatively small. There is however evidence that services that require transporting

people, especially school transport and eldercare provided at home, have substantial costs on the municipal economy (Hietala and Jauhiainen, 2013, pp. 18-22). Most of the costs of living in these areas, such as commuting and other travel costs are however carried by the people choosing to live in these places, as most public services are not provided close to these areas. They conclude though that living in dispersed settlements ultimately causes more costs to the municipal economy.

To sum up this discussion, the views on regional policies by Kangasharju et al. (1999) and Laakso and Loikkanen (2016) seem to be somewhat conflicting, Laakso and Loikkanen seem to lean towards the view that actively trying to prevent this migration movement is mostly ineffective and harmful to economic growth both on the level of the whole nation and also to the areas losing population. Kangasharju et al. (1999) on the contrary seem to emphasise the costs of this movement both in large cities and areas losing population.

What both of these authors agree on is that economic forces centralising population are so powerful now, that actively reversing this trend by policies is not realistic and not really even desired, that there are economic benefits from centralising population, and that under global competition, policies that prevent growth of cities may in the worst case cause economic activity to move to another country.

3.4 Conclusions on urbanisation development in Finland

Finland is a somewhat typical developed urbanised country, so certain predictions from theory on the relationship between urbanisation and economic growth can be applied to Finland. These predictions are that further economic growth might promote further urbanisation, Finland is probably approaching the threshold, where further urban concentration neither promotes nor harms further economic growth and urban primacy is likely going to be the variable both increasing and having some impact on the economy,

while changes in degree of urbanisation are likely not significant. The economy relying increasingly on human capital and innovative products presents uncertainty to these predictions both in Finland and in other developed countries.

Where Finland is then somewhat atypical relative to other developed countries is explained by the structure of its urban geography. Cities in Finland are relatively small, there is a large number of them, distances between them are long and they do not often form larger functional urban areas. The urban structure in Finland has been a consequence of both economic development and political guidance. Regional policies have been aimed at alleviating the differences in welfare between different regions in the country. This is expected to have decreased the rate of urban concentration. A university being located in a region or city is viewed as a powerful predictor of positive economic and population development, indicating the growing importance of human capital in the economy.

This urban geography in Finland might be harmful to productivity, especially in the current development stage of the economy, where interaction with a large pool of people with a large variety of skills is increasingly important. This might give a reason to predict, that further urban concentration can promote economic growth. This is the hypothesis being tested in the analysis in the following chapter.

Considering the fact that traditionally, there have been views that costs of urban concentration to people, such as congestion costs, crime, pollution and cost of living (Krugman, 1998, pp. 8-9; Henderson, 2003, p. 52) have acted as a decentralising force and economic benefits have acted as a centralising force, people in Finland do not seem to experience major drawbacks with urban concentration, that could act as a decentralising force. This is suggested by the fact that in addition to the plentiful availability of jobs, the living environment in large cities seems to attract new residents (Tervo, 2016, pp. 100-105). This could suggest that there is potential for further urban concentration in Finland.

4 Empirical study

In this section, an analysis of the relationship between urban concentration and economic growth in Finland is conducted. The purpose of this analysis is to attempt to explain if further urban concentration in Finland has a positive impact on economic growth. This approach is motivated by the ambiguous results in previous research concerning this phenomenon in developed countries, which were described in Chapter 2, and the observations from the urbanisation development in Finland, described in Chapter 3.

The underlying theory and the development in Finland give reasons to predict, that further urban concentration would promote economic growth. This becomes the hypothesis to be tested in this analysis. The variable of interest, urban concentration in Finland, is examined as panel data in all 19 regions of Finland during the period of years 2000-2022. This analysis is conducted using Stata 16.1. statistical software. Panel fixed effects estimation was chosen as the method to be used following the example by Bertinelli and Strobl (2007, p. 2503)

4.1 Description of data

Urban concentration used as an explanatory variable in this analysis is measured in urban primacy as the proportion of the population of the largest urban area in the region to the population of the whole region, following the example of Henderson (2003) and Bertinelli and Strobl (2007) and applying it to individual regions and the largest urban areas within them. All regions and their corresponding largest urban regions in sub-regional units are listed in Appendix 3.

Economic growth is examined as output per capita by every region in Finland. Control variables used in the model are capital per capita by region, academic education by

region and investment in research and development per capita by region. All data is gathered from the StatFin database provided by Statistics Finland (2024, d, e, f, g ,h ,i). Regional output is readily available measured in output per capita by region. Capital and investment in research and development by region are only available in absolute values, so they are transformed into per capita values by dividing by the population in the region. Output, capital and investment in research and development are measured in nominal values.

Capital and academic education are chosen as control variables following the example of the model by Bertinelli and Strobl (2007 p. 2503). Adding investment in research and development as a control variable is motivated by the findings by Kangasharju (2004) and Laakso and Loikkanen (2016, pp. 24-30) that investments in research and development vary substantially between regions. The largest proportion of investments in research and development are made in a few of the largest urban regions. 44 % of all investments in research and development are made in Helsinki region and 88 % in 10 of the largest urban regions (Kangasharju, 2004).

The measure of education is available in the StatFin database by Statistics Finland (2024g) grouped by regions in 9 levels of education. Out of these, 3 levels of academic education are picked, summed and divided by the population of the region. These levels of education are labelled as “lower academic education, upper academic education and doctoral training” (“alempi korkeakouluaste, ylempi korkeakouluaste, tutkijakoulutusaste”) (Statistics Finland, 2024g). Summary statistics of the data used are presented in Table 6 below, variable names are explained in Table 5 and pairwise correlations are presented in Table 7.

Table 5: Explanations of variable names

Variable	Explanation
gdp	Output per capita (€)
primacy	Urban primacy (%)
capital	Capital per capita (€)
education	The proportion of the population with academic education (%)
rd	Investment in research and development per capita (€)

Table 6: Summary statistics

	mean	standard deviation	min	lower quartile	median	upper quartile	max	n
gdp (€)	32264.53	7487.361	17383.6	26856.8	31679.1	36858.4	60375.8	437
primacy (%)	0.647	0.150	0.325	0.534	0.631	0.732	1	437
capital (€)	7313.206	2351.015	3345.832	5775.779	6895.622	8368.573	15328.23	437
education (%)	0.123	0.041	0.054	0.092	0.119	0.148	0.270	437
rd (€)	691.726	601.684	52.305	266.543	414.430	980.814	2721.239	437

Table 7: Pairwise correlations

	gdp	primacy	capital	education	rd
gdp	X				
primacy	0.189	X			
capital	0.796	0.113	X		
education	0.829	0.344	0.672	X	
rd	0.415	0.306	0.456	0.600	X

Summary statistics of variables used presented in Table 6 suggest that there is sufficient variation in variables, which gives a good basis for a meaningful analysis, and maximum and minimum values of variables are moderate, so there are no significant outliers causing inaccuracy in this analysis. As can then be observed from the table of correlations in Table 7, correlations between variables are mostly moderate and are high with the dependent variable gdp, which makes sense. There are however concerns about possible multicollinearity, as high correlation is also present among explanatory variables capital and education. The possibility of multicollinearity is evaluated in section 4.4., where the regression models used are presented.

4.2 Measure of urban area

Urban area is defined here as sub-regional unit ("seutukunta"), which is a unit used by Statistics Finland (2024c). This is the unit chosen as it is used in an analysis by Tervo (2016). Tervo (2016, p. 255) motivates this choice by the fact that sub-regional unit is a good estimate for a functional urban area and data measured in these units is readily provided by Statistics Finland. If for instance, municipality was used as a unit, in many instances, areas separated by administrative borders would be examined as separate areas, even though they would form a functional urban area together.

Even though sub-regional units may be the most optimal estimate for an urban area currently available for the purpose of this analysis, for a more precise analysis in possible further research, a better estimate for an urban area could be useful. The sub-regional unit of Helsinki within the region of Uusimaa could be examined to illustrate this problem. The area of the whole region of Uusimaa is 9098 square kilometres and the region consists of 26 municipalities (Uudenmaan Liitto, n.d.). Helsinki sub-regional unit contains 17 municipalities in total. In 2023, the population in the sub-regional unit of Helsinki was 93 % of the population of the whole region of Uusimaa (adapted from Statistics Finland, 2024d).

This problem is even more evident in the case of the region of Päijät-Häme, where the only sub-regional unit within the region is Lahti, so the measure of urban primacy examined within this region is 100 % during the whole analysis period (adapted from Statistics Finland, 2024d). And in the case of the region of Kymenlaakso, there are 2 sub-regional units, Kouvola and Kotka-Hamina, with almost equal populations in 2023, 79778 in Kotka-Hamina and 78880 in Kouvola (adapted from Statistics Finland, 2024d). Therefore, it is questionable whether there is a meaningful interpretation of urban primacy in this region.

So, it is therefore evident that sub-regional units can be relatively large in both area and population and might not be optimal to capture the measure of a functional urban area, even though they are the most optimal measure available for the purpose of this analysis. To illustrate this problem, the region of Uusimaa and its municipalities are shown in Image 1 below provided by Uudenmaan Liitto (n.d.). The municipalities within the sub-regional unit of Helsinki according to Statistics Finland (2023) are Espoo, Helsinki, Hyvinkää, Järvenpää, Karkkila, Kauniainen, Kerava, Kirkkonummi, Lohja, Mäntsälä, Nurmijärvi, Pornainen, Sipoo, Siuntio, Tuusula, Vantaa and Vihti.

Image 1: Municipalities in the region of Uusimaa (Uudenmaan Liitto, n.d.).

4.3 Model description

The model used for this analysis uses panel data of all 19 regions of Finland observed yearly during the period 2000-2022. The motivation for choosing this approach is the availability of data on variables used in this model. A longer observation period was not possible since comparable data on all variables used in the analysis was not available for a longer period in the StatFin database by Statistics Finland.

The approach of observing a panel of regions was therefore chosen to improve the accuracy of the analysis that would have otherwise been limited due to the short observation period. Another possible approach would have been to observe the whole nation and urban primacy only by Helsinki region for a longer period of time, but this would have resulted in fewer variables in the model, as data on education and investment in research and development were not available for a longer period than from the 1970s on. Another motivation for this is the fact that in their analyses which were used as

guidance for constructing this analysis, Henderson (2003) and Bertinelli and Strobl (2007) observed a large group of countries. Therefore, observing a group of regions within Finland was determined to be a more natural approach.

The method used in this analysis was panel fixed effects estimation. This is an appropriate choice as this is the same method that was used in the analysis by Bertinelli and Strobl (2007 p. 2503), which makes comparing the results to previous research possible. The characteristics of this method are also appropriate, as there are reasons to expect the regions analysed to have different characteristics possibly influencing the results of the analysis, which are difficult to control for with variables, but are controlled by this method, as suggested by Torres-Reyna (2007, pp. 18-19). The analysis was conducted following the instructions by Stata (n.d. a). The model used for this analysis is described by the equation:

$$\text{loggdp} = \text{primacy} + \text{logcapital} + \text{education} + \text{logrd} + \text{year} + \text{\_cons} \quad (1)$$

And the model used by Bertinelli and Strobl (2007) is described by the equation:

$$\text{loggdp} = \text{primacy} + \text{primacy}^2 + \text{logcapital} + \text{human capital} + \text{democracy} + \text{\_cons} \quad (2)$$

Explanations of variables are listed in Table 8 below:

Table 8: Explanations of the variables used

Variable name	**Explanation**
loggdp	(natural logarithm of) Output per capita, by nation or region
primacy	Urban primacy
primacy^2	Urban primacy squared
logcapital	(natural logarithm of) Capital per capita, by nation or region
education	The proportion of the amount of academically educated persons to the whole population, by region
human capital	The average years of schooling in the total population aged 25 and over
logrd	(natural logarithm of) Investment in research and development per capita, by region
democracy	Democracy index
year	Year
_cons	Constant

The accurate definitions for the variables human capital and democracy used by Bertinelli and Strobl can be found in the paper by Bertinelli and Strobl (2007, p. 2508). In this model, variables of primacy^2 and democracy are dropped. Primacy^2 is dropped after first running the regression model with both variables primacy and primacy^2 and seeing that both variables are now statistically non-significant. Democracy is dropped because in this analysis, a single country is observed and there are no good reasons to expect the level of democracy to vary substantially between regions in Finland, while Bertinelli and Strobl (2007) analysed a large group of countries with substantial variations in their levels of democracy.

5 Results

In this section, the results of the fixed effects analysis are presented, the validity and possible limitations of the model are evaluated, some suggestions for further research are given, and the political and social implications of these results are discussed.

3 separate regression models had to be created because in the first attempted model with the variable primacy squared, constructed following the example by Bertinelli and Strobl (2007, p. 2503), the variables primacy and primacy squared were proven to be statistically non-significant. A model with the variable primacy squared excluded was then tested. With both models with primacy squared included and excluded, the education variable behaved unpredictably as it had a negative coefficient. Creating a model with the time trend excluded solved this problem. The models estimated and the process that led to constructing these models are described in the next section. The results are then compared to the fixed effects model by Bertinelli and Strobl (2007, p. 2503).

5.1 Regression models

In Table 9 below, Model 1 indicates the model with a time trend included and primacy squared excluded, Model 2 indicates the models with both a time trend and primacy squared excluded, and Model 3 indicates the model with the time trend and primacy squared included.

Table 9: Regression models

	Model 1	Model 2	Model 3
primacy	0.666**	0.726**	0.107
	(0.296)	(0.342)	(0.910)
primacy^2	-	-	0.466
			(0.717)
logcapital	0.142***	0.164***	0.141***
	(0.018)	(0.020)	(0.018)
education	-2.533***	3.244***	-2.609***
	(0.516)	(0.204)	(0.529)
logrd	0.063***	0.099***	0.064***
	(0.014)	(0.015)	(0.014)
year	0.030***	-	0.030***
	(0.003)		(0.003)
_cons	-51.534***	7.422***	-51.990***
	(4.953)	(0.245)	(5.006)
N	437	437	437
R^2			
Within	0.914	0.885	0.915
Between	0.013	0.275	0.015
Overall	0.436	0.471	0.421

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

N = Number of observations

R^2 = Coefficient of determination

Conducting the analysis first with Model 3 with primacy squared and the time trend included led to both variables primacy and primacy squared being statistically non-significant. Their non-significance was further confirmed by conducting an F-test, which resulted in the p-value for the hypothesis that both variables are statistically significant being 0.0653. Therefore, they were confirmed to be non-significant if a significance level of 0.05 was used. Choosing a significance level of 0.05 to determine which variables are statistically significant would be appropriate here, as most variables in this model are significant with a p-value below this, but not below a p-value of 0.01.

The second attempt was to run a regression with primacy squared excluded, which is Model 1. This led to the variable primacy being statistically significant. In both cases of Models 1 and 3 though, a puzzling result was the coefficient of the variable for academic education being negative and around -2.5. This is worrying as this result conflicts with both common sense and the prediction from theory that especially in developed countries, academic education is a strong predictor of productivity and economic growth. Even in the FE model by Bertinelli and Strobl (2007, p. 2503), presented in Table 10, the coefficient for human capital is +0.017.

The third attempt to solve this issue was to run a regression with the time trend excluded, as illustrated by Model 2. Results from this model made more sense now, the coefficient for education is now +3.244, which is aligned with our expectations. Coefficient changes of other variables were minor and no reversal in the signs of the coefficients occurred. In both Models 1 and 2, the variable for urban primacy is statistically significant and its coefficient is positive. The interpretation of these coefficients is that in the case of Model 1, a change of one percentage point in urban primacy would result in a 0.66 % increase in output or gross domestic product, or a 0.73 % increase in the case of Model 2.

Table 10: Fixed effects model by Bertinelli and Strobl (2007)

Variable	**FE estimator**
primacy	-0.938*
$primacy^2$	0.694
ln(capital/labour)	0.447***
human capital	0.017
democracy	-0.004
_cons	0.195*
N	400
R^2	0.29

* p<0.10, ** p<0.05, *** p<0.01

5.2 Evaluation

To consider whether these models are valid, the observation mentioned in section 4.1. and illustrated in Table 7, that there are relatively high correlations between some explanatory variables, should be discussed. These correlations raise a concern of a possibility of multicollinearity that should be evaluated. This concern can however be rejected as symptoms of multicollinearity are not present here, all variables in Models 1 and 2 are statistically significant and there are no exceptionally small or large coefficients. To confirm this assumption, several models were created with some variables dropped. This however resulted in coefficients of determination decreasing with no apparent improvement in these models. Models using year dummy variables instead of a time trend were also tested, but the results were basically the same, so the models with a time trend were chosen due to them being simpler and a more natural approach for the purpose of this analysis. Eventually, Models 1 and 2 presented here were chosen as most suitable to be evaluated for the purpose of this analysis.

Coefficients of determination in the models should then be observed to determine the reliability of the models. According to Stata (n.d. b), in a fixed effects model, the coefficient of determination within has the properties of an ordinary coefficient of determination, so it is relevant in determining the goodness of fit of this model. Coefficients of determination within groups are high, around 0.9 in all 3 models, so we can conclude that these models explain a large share of the variance in the dependent variable and are therefore reliable.

Another concern was the dramatic changes in the coefficient of education variable between models. The likely explanation for this is that the proportion of academic education correlates heavily with the time trend. This is one flaw of this analysis, as measuring the relative impact of changes in education level on economic growth now becomes impossible. This does not prevent us from estimating the impact of urban primacy on economic growth though, which is the main variable of interest in this analysis. Therefore, attempting to solve the issue with the education variable is not really relevant and remains to be out of the scope of this analysis. Solving this issue would however be a relevant goal for further research.

To illustrate the relationship between output and education, a graph of the mean output across regions is presented in Figure 3 below, and a graph of the mean proportion of the population with academic education across regions is presented in Figure 4 below. As can be observed from these graphs, output and academic education have a simultaneous increasing trend, so the result with a negative coefficient for education in Model 1 is not credible. Graphs of all means of variables across regions are presented in Appendix 5.

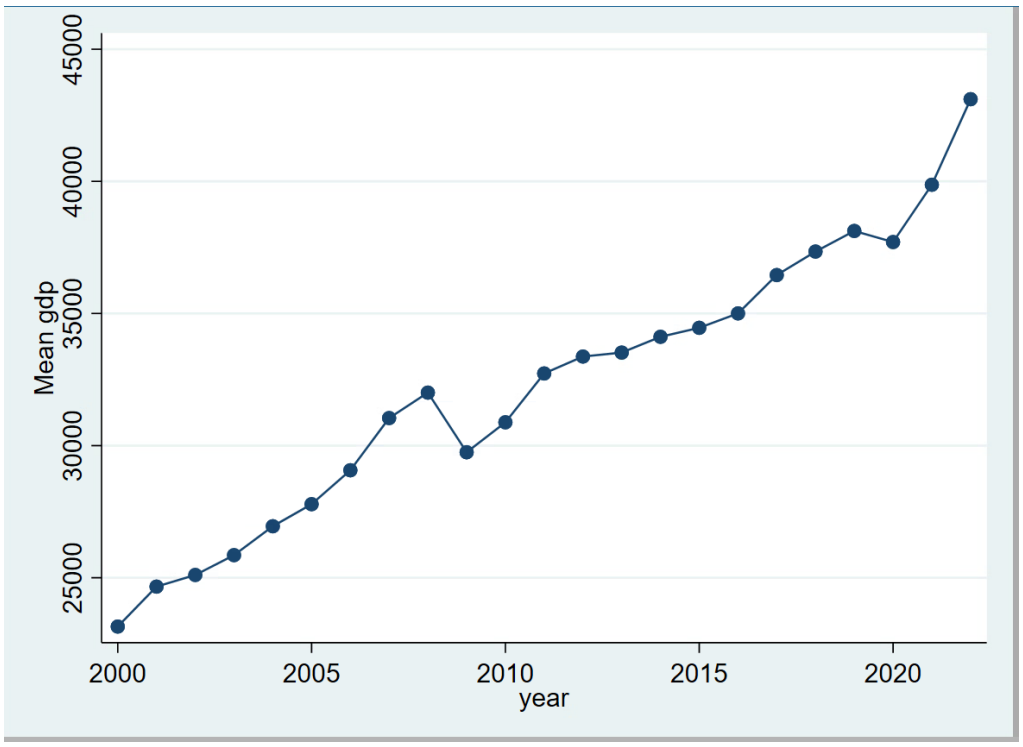

Figure 3: Mean output per capita across regions (a)

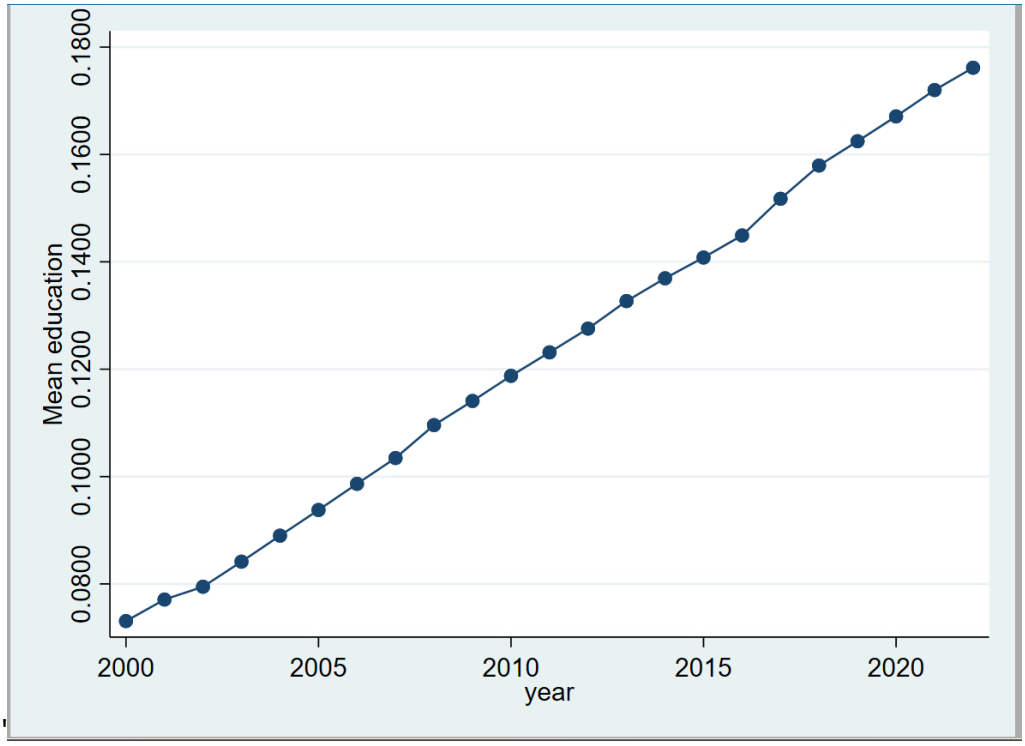

Figure 4: Mean proportion of the population with an academic education across regions (a)

Returning to analysing the impact of variable urban primacy then, results from Models 1 and 2 remain relevant. In both cases, this variable is statistically significant and its coefficient is positive. The interpretation of these coefficients is that in the case of Model 1, a change of one percentage point in urban primacy would result in a 0.66 % increase in output or gross domestic product, or a 0.73 % increase in the case of Model 2.

Since the model with primacy squared proved to not be functional, the relationship between urban concentration and economic growth in Finland proved to be linear. This conflicts with the prediction by Bertinelli and Strobl (2007, p. 2501) suggesting nonlinearity to be a central characteristic of this relationship. The main conclusion of these analyses is however similar, the impact of an increase in urban primacy on economic growth being positive. The hypothesis that further urbanisation would promote economic growth in Finland is accepted.

One possible exogenous factor affecting the reliability of these results is the development of the economy itself in Finland during the observation period 2000-2022. As can be observed from Figure 2 describing the historical development of real gross domestic product per capita in Finland during the period 2008-2022, the gross domestic product per capita first decreased and then remained stagnant. During this period, the 2008 financial crisis occurred (Szczepanski, 2019, p. 2). Additionally, at the end of this period, the economic crisis caused by the coronavirus pandemic in 2019 harmed the Finnish economy (Bank of Finland, 2022). It is quite possible that these exogenous factors cause unreliability in these results. According to Statistics Finland (2022), the beginning of the negative impact on the economy of Finland caused by the war in Ukraine is visible in 2022, so its impact is likely not affecting this analysis.

5.3 Limitations

Despite this clear conclusion of the positive impact of urbanisation and economic growth, some open questions for potential further research remain. The first one requiring further investigating would be the result of a linear positive impact of urban primacy on economic growth and the magnitude of this impact. This result is surprising, considering the prediction by Bertinelli and Strobl (2007, pp. 2505-2506) that the impact of urban primacy would be decreasing the more developed and urbanised a country is.

Another open question is the argument by Tamang (2013, p. 43), that in developed countries, the direction of the causation would be economic growth promoting urban concentration should be evaluated. This analysis examined only one direction of causality, the impact of urban concentration on economic growth but not the potential reverse causation. Investigating this causality is out of the scope of this analysis, but this is again a relevant question to be investigated in possible further research.

Another flaw of this analysis was the nonoptimal measure of urban area used to determine urban primacy. If a similar analysis was created which would examine either Finland or another comparable country, using a more precise estimate for a functional urban area would likely result in a more precise analysis. Attempting to estimate a reliable model with both the impact of education and time would also be helpful to capture all the relevant aspects of this analysis.

One more suggestion would be conducting an analysis with an approach of examining urban concentration defined as the growth of the largest city relative to the national population, and its impact on economic growth, either in Finland or another comparable country. This approach was not possible here due to suitable data not being available.

5.4 Political and social implications

Considering the fact that the motivation for this analysis was the observation by Laakso and Loikkanen (2016, pp. 21-24), that during the last 30 years, the main population growth has occurred in Helsinki region and 6 of the largest urban regions, but the approach in this analysis was to analyse the growth of largest urban areas in all regions in Finland, this analysis does not exactly explain the impact of this development. If this result is however generalised to the case of Helsinki region or a couple of the largest urban areas and the whole country, assuming the concentration of population in these areas to promote economic growth at the national level is credible, but only careful applications of these results in different scenarios should be made.

There are reasons to expect the impact of the growth of these largest urban areas on the economy to be very different. This is suggested by the observations by Moretti (2013, p. 7) and Nylund et al. (2022, pp. 675-677), that even middle-sized and large cities can suffer from this urban concentration development, as the structure of the economy of a city and the education level of its population can be even more important in determining the future of its development than its size. Therefore, the economic impact of cities growing might be expected to not be similar across cities in Finland.

Some of the cities in Finland which might be expected to not benefit from this development may be the largest central cities of their region, as can be observed from Tables 11 and 12 in Appendices 1 and 2. The largest urban areas of their regions, which were used in determining the measure of urban primacy in this analysis, but which had lost population during the period 1993-2023 were Pori, Lahti, Kotka-Hamina, Kajaani and Mikkeli. The growth of these urban areas was used to explain the growth of output, even though on the national level the consequences of these cities growing might not be comparable to the growth of the largest cities.

This analysis focused strictly on the economic aspect of urban concentration, specifically, the growth of output per capita. Improving economic welfare is an important factor determining the well-being of the people and is generally viewed as a desirable outcome

but despite this, it is not the only relevant aspect of the consequences of a social change of this great magnitude. A variety of other aspects of further urban concentration exist, some of which may be perceived as undesirable, as illustrated by Pantsu (2019).

Uneven regional development is one obvious consequence of further urban concentration. This is an inevitable consequence of this development when population growth and economic activity concentrate in a couple of the largest urban areas. Halting this development can be damaging to the prosperity of the whole national economy, as the prerequisites of profitable economic activity just do not exist anymore in the areas losing population, and preventing the growth of large cities in the global competition may lead to economic activity moving abroad.

It then becomes a political decision, will the people remaining in these areas be supported by redistributive policies and how high costs of this redistribution are acceptable. Should these people be encouraged to move to cities, encouraged to stay or should the political system just not take any stance, is a question to be evaluated in the political process. Halting urban concentration is a political option, but the economic costs of doing so may be substantial.

Another aspect of this question is the overall well-being of the people. Even if economic welfare may be higher for everyone if more people live in large cities, it is not the only measure of the well-being of the people. The perceived quality of life in cities varies among individuals, some enjoy living in urban environments and enjoy the services and amenities cities provide, and this is an actual remarkable pull factor attracting people to migrate to cities, as suggested by Tervo (2016, pp. 100-105). Some people do not enjoy living in cities though, and the costs and drawbacks of living in cities, some of which are actual economic costs, and some of which are other factors affecting the quality of life, are undeniable. Some of these actual economic costs, mainly crowding and commuting costs and the cost of housing have even been taken into account in theories in urban economics, such as by Duranton and Puga (2004, pp. 10-12).

If this urban concentration development proceeds, it might result in living in rural areas and small towns becoming difficult or impossible due to fewer or no jobs or services being available there anymore. It will be then an open political question, should there be political measures that guarantee the prerequisites of people being able to live in these areas. Choosing where to live is usually viewed as a part of the people's right to self-determination, but it is open to interpretation, whether this should be extended to policy measures enabling people to live where they want. Or if certain policy measures, such as shutting down public services, weaken the possibilities to live in some areas, could it be argued that they actually violate these rights? And as for the city structure itself, as Prieto et al. (2015, p. 814) suggested, sufficiently dense cities function the most efficiently, but it is open for discussion if this creates pleasant living environments for the residents.

One more aspect of the social consequences is environmental concerns. As Koste et al. (2020, pp. 9, 11) suggest, the impact of urban concentration on greenhouse gas emissions operates in two opposite directions. More people living in dense urban environments means less need to travel long distances and arranging transportation by public transport becomes more convenient. Dense buildings tend to also be more energy-efficient, especially if the buildings are new. This results in lower greenhouse gas emissions.

Alternatively, the construction of new buildings emits massive quantities of greenhouse gas emissions, and the need for new construction in the situation of predicted large-scale migration to the largest cities will be massive. Determining which of these factors is stronger, and therefore dictating which is the optimal scale of urban concentration in environmental terms is difficult. Koste et al. (2020, pp. 11-12) do note that potential new low-emission construction materials might alleviate the emissions of new construction. Koste et al. (2020, pp. 11-12) add that new innovative products and business models in forest industries based on mitigating greenhouse gas emissions might result in an

increasing need for labour in rural areas. These are all relevant social consequences of this development, but obviously, taking them into account in this analysis was not viable.

If then after all these considerations, the economic benefits of urban concentration were viewed as a desirable target, would there be any potential policy measures that could be applied to support this development, or are any policy measures necessary? This urban concentration development is mainly driven by economic forces, so even if no policies would intervene with this development, this development is expected to proceed by itself.

However, some potential policy measures exist which could support this development or remove some obstacles to it. One essential policy measure proposed by Laakso and Loikkanen (2016, pp. 36-51) is adjusting zoning policies to enable the growth of cities. The current situation in Helsinki is that the zoning of new housing has been constantly too low to meet the demand for housing, and the zoning of dense housing in the city centre has been restricted. Fixing at least one, or both of these would remove this obstacle to its growth and there might also be a need to evaluate, if the zoning of housing is sufficient in other growing cities in Finland or if the housing in cities is dense enough outside the city centre for the efficient functioning of the city.

Another proposal would be reconsidering the role and extent of redistributive regional policies, as discussed by Laakso and Loikkanen (2016, pp. 71-81) and Kangasharju et. al. (1999, pp. 21-23). Some extent of redistributive policies may be viewed as desirable or necessary in order to ensure that a large proportion of the areas in Finland would not become unlivable, but there should be careful consideration of whether these policies are cost-effective, and do they potentially displace profitable economic activity elsewhere.

The social costs of the urban structure are also worth considering. As Hietala and Jauhiainen (2013, pp. 5, 18-22) note, the social cost of low-density dispersed settlements in

the form of infrastructure costs and the costs of certain public services is higher compared to dense urban areas. Obviously, decreasing these costs is beneficial to everyone as it enables lowering the tax rate, allocating this tax revenue to other public services or amortisation of government debt.

If some forms of redistributive regional policies are desired, one potential option could be supporting universities in middle-sized cities, considering the notion that universities are seen as powerful predictors of positive regional development and that the growing middle-sized cities in Finland have been those where a university is located, as discussed in Chapter 3. Founding new universities as a regional policy measure likely won't be a solution since a university or a university consortium already exists in most of the middle-sized cities in Finland, as can be observed in Tables 3 and 4, but the existing universities could be supported by public funding or other viable measures.

6 Conclusions

The purpose of this thesis was to investigate the relationship between urbanisation and economic growth in Finland and to analyse if further urbanisation would promote economic growth. Theory regarding the connection between urbanisation and economic growth was presented and the urbanisation development in Finland was characterised. Predictions based on these were utilised to conduct an empirical analysis of the relationship between urbanisation and economic growth.

The result of the analysis in this thesis confirms the hypothesis that further urbanisation would indeed promote economic growth in Finland. Some open questions nevertheless remain. Interpreting the impact of an increase in the proportion of academic education was unfortunately not possible though due to its interaction with the time trend. The impact of urban concentration on economic growth also proved to be linear, which conflicts with the predictions from the theory.

How these results of the impact of urban concentration should then be interpreted and applied in different scenarios is not straightforward. This analysis was motivated by the observation of population growth concentrating in Helsinki region and 6 of the largest urban regions, so analysing the impact of this development would have been a more natural approach. This was unfortunately not possible due to suitable data not being available for a sufficiently long period. Urban concentration and its impact on economic growth had to be then examined in this analysis at the level of individual regions.

This approach might therefore not give a satisfactory explanation to the economic impact of this current urban concentration development at the national level but only describes the impact of urban concentration at a general level. Generalising this result and applying it to the case of Helsinki region or a couple of the largest urban areas and the whole country might imply though, that the concentration of population in these areas promotes economic growth at the national level.

What social implications this conclusion and past literature have then is that since the economic realities in Finland are not favourable to the regions currently struggling with people and economic activity moving away, the substantial economic gains of urban concentration are evident and actively halting this development can severely harm the national prerequisites of economic prosperity, the society is facing the difficult question of how to respond to this development. There are reasons to expect that similar questions must be evaluated in other developed countries too.

The conclusions of this analysis and past research define the economic constraints of what social responses to this question are possible. If the price of uneven regional development or other possible undesired consequences of further urban concentration is perceived to be too high, there are alternatives to just adapting to this development.

There will always be the choice of balancing between economic benefits and possible other goals, such as solidarity within regions. These alternatives may have substantial costs, but they are nevertheless an option. And on the contrary, the economic benefits of this development could create substantial welfare or at least maintain the level of welfare developed societies are used to, so these economic benefits should not be ignored without thorough consideration. The response to this question is ultimately shaped by what the people value to be the characteristics of a good society.

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Appendices

Appendix 1. Population growth in urban areas in Finland 1993-2023 (sub-regional units)

Table 11: Population growth in urban areas in Finland 1993-2023 (adapted from Statistics Finland 2024d)

Urban area	**Population growth (%)**
SK171 Oulu	+53 %
SK011 Helsinki	+41 %
SK064 Tampere	+40 %
SK212 Ålands landsbygd	+36 %
SK131 Jyväskylä	+31 %
SK023 Turku	+26 %
SK015 Porvoo	+16 %
SK112 Kuopio	+15 %
SK211 Mariehamns stad	+14 %
SK191 Rovaniemi	+11 %
SK152 Vaasa	+11 %
SK051 Hämeenlinna	+9 %
SK052 Riihimäki	+7 %
SK162 Kokkola	+6 %
SK142 Seinäjoki	+4 %
SK154 Jakobstadsregionen	+3 %
SK091 Lappeenranta	+1 %
SK122 Joensuu	0 %
SK071 Lahti	-1 %
SK022 Salo	-1 %
SK177 Ylivieska	-3 %

Urban area	**Population growth (%)**
SK063 Etelä-Pirkanmaa	-4 %
SK196 Tunturi-Lappi	-8 %
SK025 Loimaa	-10 %
SK014 Raasepori	-10 %
SK043 Pori	-10 %
SK021 Åboland-Turunmaa	-10 %
SK041 Rauma	-11 %
SK082 Kotka-Hamina	-13 %
SK182 Kajaani	-13 %
SK101 Mikkeli	-13 %
SK053 Forssa	-15 %
SK024 Vakka-Suomi	-15 %
SK213 Ålands skärgård	-15 %
SK016 Loviisa	-15 %
SK068 Lounais-Pirkanmaa	-16 %
SK135 Äänekoski	-17 %
SK081 Kouvola	-17 %
SK174 Raahe	-18 %
SK153 Sydösterbotten	-18 %
SK197 Pohjois-Lappi	-19 %
SK192 Kemi-Tornio	-19 %
SK173 Oulunkaari	-20 %
SK178 Koillismaa	-23 %
SK176 Nivala-Haapajärvi	-23 %
SK061 Luoteis-Pirkanmaa	-23 %
SK114 Varkaus	-25 %
SK161 Kaustinen	-25 %
SK144 Kuusiokunnat	-25 %

Urban area	**Population growth (%)**
SK111 Ylä-Savo	-26 %
SK103 Savonlinna	-26 %
SK044 Pohjois-Satakunta	-27 %
SK141 Suupohja	-27 %
SK134 Jämsä	-27 %
SK175 Haapavesi-Siikalatva	-29 %
SK093 Imatra	-29 %
SK133 Keuruu	-29 %
SK105 Pieksämäki	-29 %
SK115 Sisä-Savo	-30 %
SK146 Järviseutu	-30 %
SK069 Ylä-Pirkanmaa	-31 %
SK138 Saarijärvi-Viitasaari	-32 %
SK132 Joutsa	-33 %
SK124 Keski-Karjala	-36 %
SK125 Pielisen Karjala	-39 %
SK113 Koillis-Savo	-40 %
SK193 Torniolaakso	-41 %
SK181 Kehys-Kainuu	-43 %
SK194 Itä-Lappi	-43 %

Appendix 2. Regions and central urban areas used in the analysis

Table 12: Regions and their central urban areas used in the analysis (adapted from Statistics Finland 2024d)

Region	**Sub-regional unit**
MK01 Uusimaa	SK011 Helsinki
MK02 Varsinais-Suomi	SK023 Turku
MK04 Satakunta	SK043 Pori
MK05 Kanta-Häme	SK051 Hämeenlinna
MK06 Pirkanmaa	SK064 Tampere
MK07 Päijät-Häme	SK071 Lahti
MK08 Kymenlaakso	SK082 Kotka-Hamina
MK09 Etelä-Karjala	SK091 Lappeenranta
MK10 Etelä-Savo	SK101 Mikkeli
MK12 Pohjois-Karjala	SK122 Joensuu
MK13 Keski-Suomi	SK131 Jyväskylä
MK14 Etelä-Pohjanmaa	SK142 Seinäjoki
MK15 Pohjanmaa	SK152 Vaasa
MK16 Keski-Pohjanmaa	SK162 Kokkola
MK17 Pohjois-Pohjanmaa	SK171 Oulu
MK18 Kainuu	SK182 Kajaani
MK19 Lappi	SK191 Rovaniemi
MK21 Ahvenanmaa	SK212 Ålands landsbygd

Appendix 3. Graphs of means of variables across regions

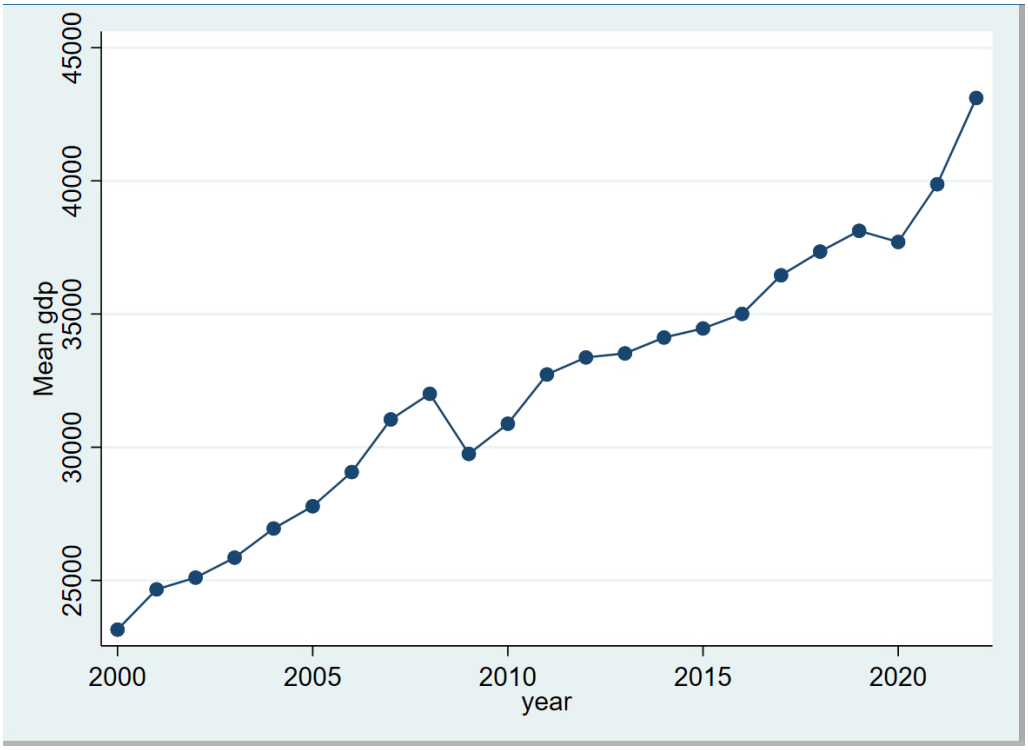

Figure 5: Mean output per capita across regions (b)

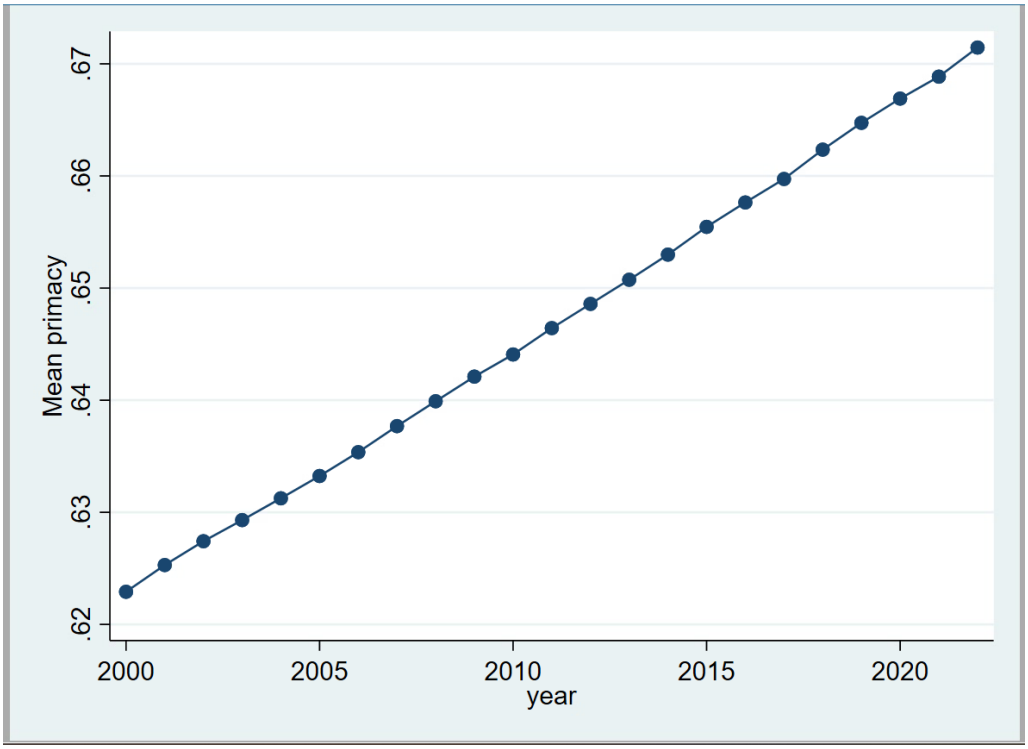

Figure 6: Mean urban primacy across regions

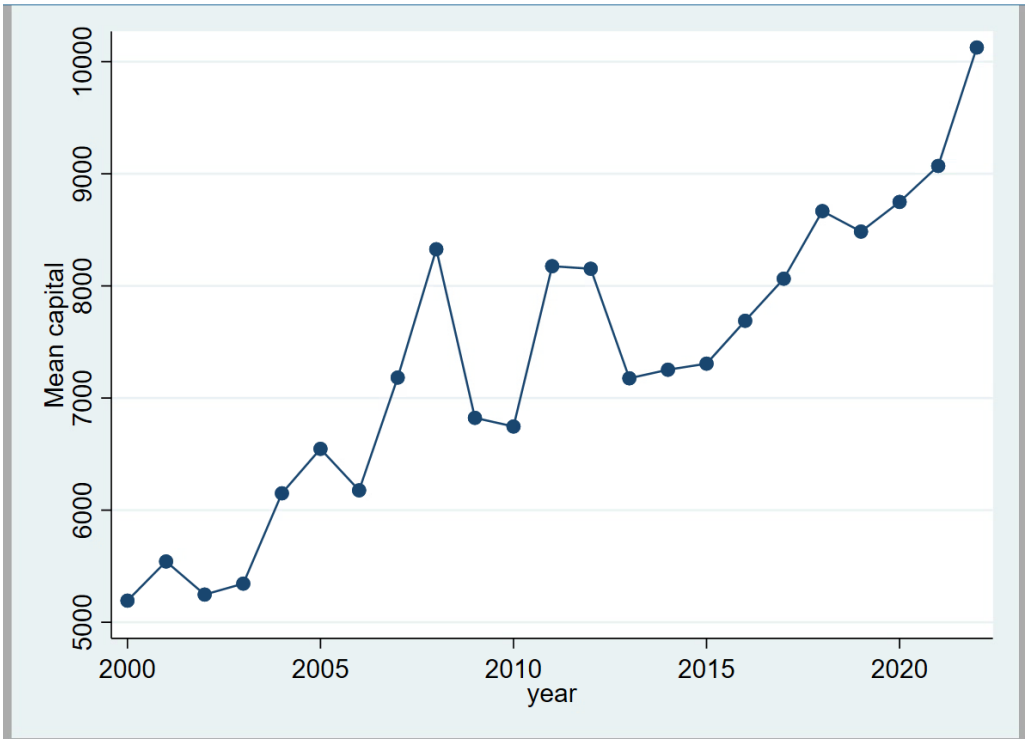

Figure 7: Mean capital per capita across regions

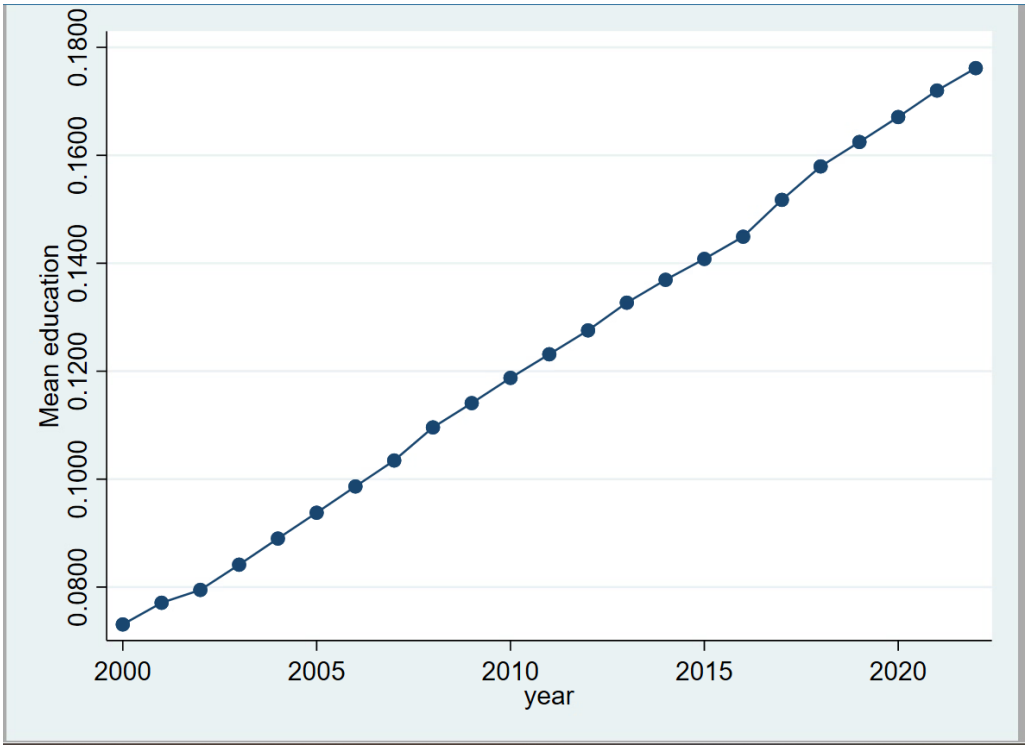

Figure 8: Mean proportion of the population with an academic education across regions (b)

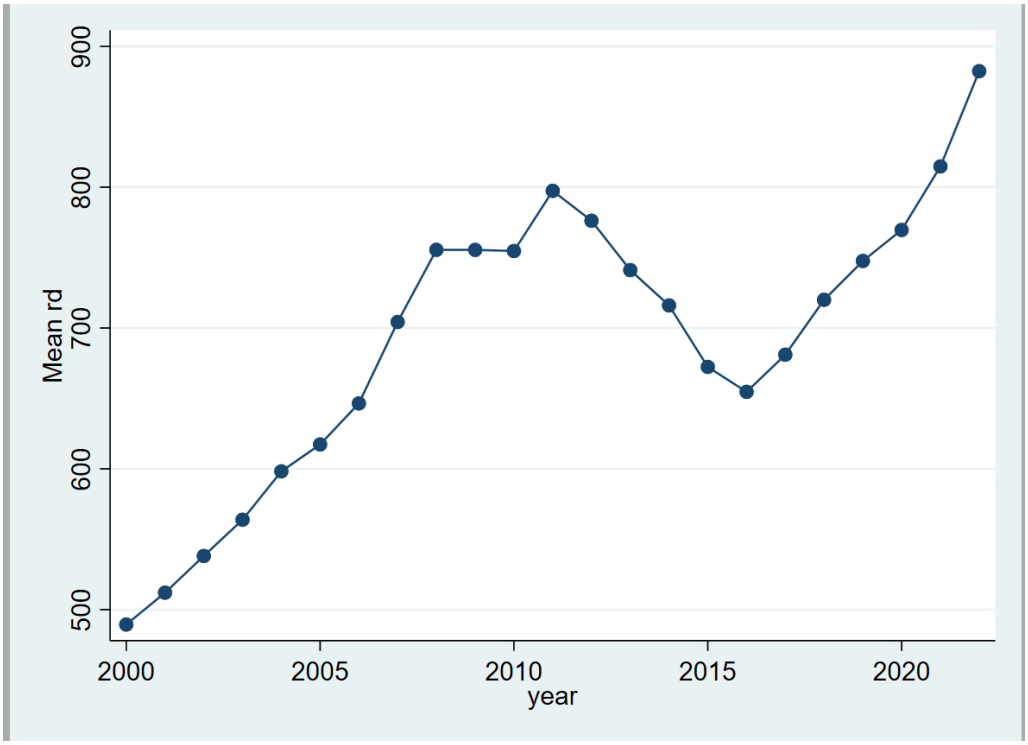

Figure 9: Mean investment in research and development per capita across regions