Immigration and healthcare

A deeper look into public healthcare expenditure and reimbursements for private healthcare in Finnish regions 2010-2019

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Abstract for Master's thesis

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Unlike other Nordic countries, Finland was a relatively homogenous society for most of the 20th century. With immigration increasing in the last three decades, however, the public debate on the effects of immigration has grown louder. For some, immigration is a remedy for a worsening dependency ratio and fiscal sustainability, while others fear migrants are overusing the benefits provided by the Nordic welfare system. In this heated debate, the need for fact-based evidence on the effects of migration is obvious. In this thesis, the impact of immigration on the welfare system is analyzed through the lens of healthcare. In the thesis, the Finnish healthcare market is examined by analyzing public healthcare expenditure and reimbursements for private healthcare services by the social insurance institution (Kela). The effects are analyzed on regional level for the years 2010-2019 with a two-way fixed effects-model. The findings indicate that an increase in the share of immigrants in the Finnish population had a substantial negative impact on public healthcare expenditure per capita during the years 2010-2019. Furthermore, the findings reveal little to no evidence of immigration causing a crowding out-effect from public to private service providers among consumers in the healthcare market. The thesis adds to a growing literature on immigration and healthcare, while providing new insight into the impact of immigration on the Finnish healthcare market.

Keywords: migration, immigration, healthcare, welfare state, welfare magnet theory, self-selection, initial health selection model, healthy immigrant effect, health economics, welfare economics

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1 Introduction

Topics related to migration have received a great deal of attention in economic and social scientific literature in recent years. While, historically, much of the economic research on immigration has focused on the labor market impact in receiving countries, the broader welfare effect of migrant arrival has remained less explored in empirical literature. In the public debate in Finland and other EU countries, however, the subject has become a focal talking point in recent years. The debate has become increasingly polarized and previous research shows that media coverage on the issue often lacks nuance (Eberl et al., 2018). In a setting such as this, the value of empirical research is emphasized. Thus, in this thesis, the welfare effects of immigration are analyzed. The impact of immigration is examined through its effect on the healthcare system, an essential part of the Nordic welfare system. The analysis is conducted with Finnish data, covering data on healthcare expenditure and reimbursements for private healthcare during the years 2010-2019.

The healthcare market is of particular interest, as the Finnish population is ageing rapidly, and thus placing pressure on the public healthcare system. The impact is two-fold. First, the demand for healthcare services is expected to increase as the population grows older. This is likely to result in increased public healthcare expenditure, which has already followed a growing trend for a long period of time. Second, an ageing population entails an increasing dependency ratio, which in turn poses a challenge to the funding of the public healthcare system. As the workforce diminishes, so does the income tax base through which the public healthcare system is largely funded. While immigration impacts the healthcare system in both ways, the analysis in this thesis is focused on the demand for healthcare services. As the Finnish healthcare system is mixed, *i.e.* both public and private service providers operate in the market, the impact is studied both through public healthcare expenditure and through reimbursements for private healthcare service usage by the social insurance institution (Kela). By analyzing the effect of immigration on reimbursements for private healthcare, in addition to public healthcare expenditure, a more complete picture of the effect of immigration on the demand-side of the healthcare market emerges.

The thesis draws inspiration from a similar study previously conducted by Bettin and Sachhi (2020) on healthcare expenditure and migration in Italy. As such, the thesis contributes to an academic discussion on the welfare effects of migration in Europe and, more specifically, adds to the scarcer academic literature on the welfare impact of immigration in a Finnish context. In the last chapters of the thesis, the results are discussed and compared to the results obtained by Bettin & Sacchi in 2020.

The remainder of the thesis is structured as follows. In the second chapter, migratory patterns to Finland and the Finnish healthcare system are presented. Furthermore, some background on the labor market effects and the current situation of immigrants in Finland are discussed. The third chapter concerns theory on both migration and healthcare markets, followed by previous literature in the fourth chapter. In subsequent chapters, data, empirical model, results, and analysis are presented. Lastly, the conclusion of this thesis is presented in chapter nine.

2 Background

For much of the 20th century, immigration to Finland was relatively moderate. In the last decades, however, the number of immigrants arriving to Finland has increased substantially (Official Statistics of Finland, 2022d), and the topic of immigration has become a focal talking point in politics. The purpose of this section is to provide insight into the patterns of migration into Finland in past years and discuss the current social climate with regards to immigration. Moreover, central aspects of the Finnish healthcare system are presented before delving into the theoretical framework of the thesis.

2.1 Immigration to Finland

Finland was a remarkably homogenous society up until the 1990's, with an immigration population of approximately 1 % of the total population in the beginning of the decade (Official Statistics of Finland, 2022a). During the last thirty years, however, this has changed considerably with immigrants and immigrants' descendants amounting to around 8 % of the total population in 2020 (Valtioneuvosto, 2021). On an international scale, however, this is still a modest number of people with an immigrant background. A Nordic comparative analysis shows that Finland had the lowest share of immigrants in the Nordic countries in 2017, with a share of 5.6 % of total population compared to 17 % in Sweden, 13.8% in Norway, 9.9 % in Denmark and 10.6 % in Iceland (Østby & Aalandslid, 2020)[1]. In addition, there is significant variation in the share of immigrants within Finland, and most immigrants live near or within bigger cities in the southern and western part of the country (Valtioneuvosto, 2021). Examining the number of immigrants to Finland according to nationality reveals that the five largest groups of foreign nationals in 2020 comprised of Estonian, Russian, Iraqi, Chinese and Swedish nationals, followed by cit-

[1] Note that Valtioneuvosto (2021) concerns immigrants and immigrant descendants while (Østby & Aalandslid, 2020) concerns immigrants only. Thus, estimates for the share of immigrants in the total population depends on how the term immigrant is defined.

izens of Thailand, India, Afghanistan, Syria, Vietnam, Somalia, Ukraine, and Turkey (Tilastokeskus, 2022). Of these, the Estonian group is by far the largest, comprising of more than 50 000 individuals, followed by Russians at nearly 29 000 individuals, Iraqis at approximately 14 700 individuals and Chinese at close to 10 500 individuals. Other groups consist of less than 10 000 individuals. Moreover, the age distribution among the immigrant population is different to that of the general population, as there are less children and elderly among the immigrants (Tilastokeskus, 2022).

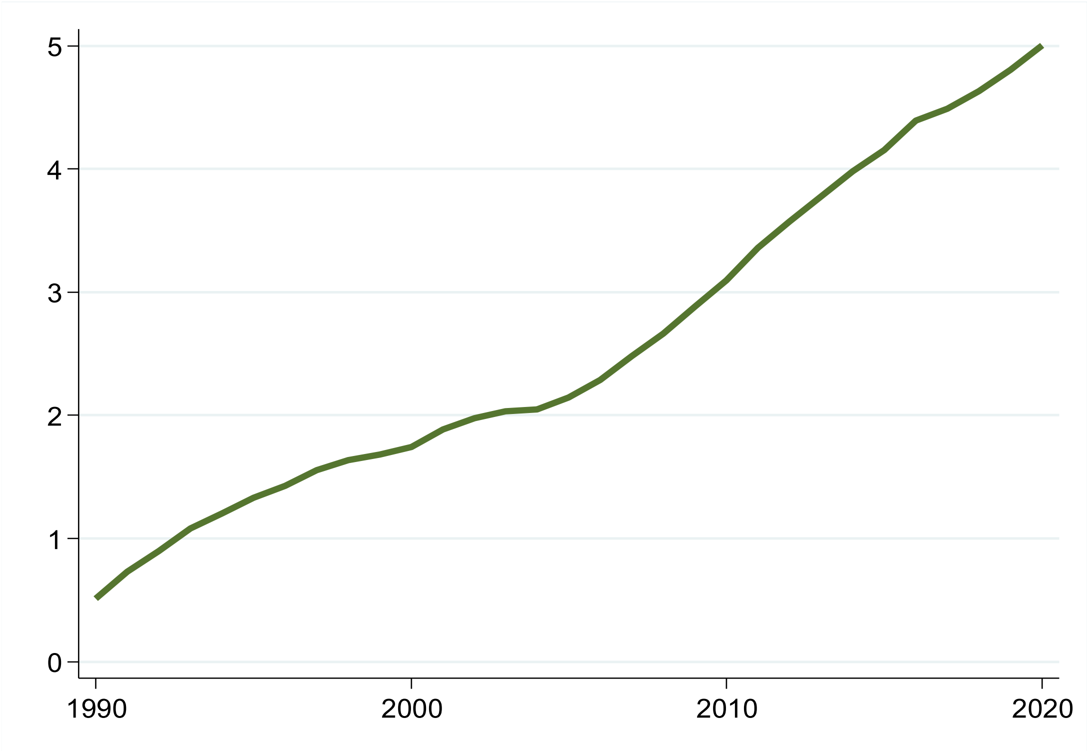

Figure 1. The percentage share of foreign nationals compared to Finnish nationals. Source: Own elaboration based on population data from Statistics Finland.

In a study that reviewed self-reported causes of immigration to Finland, more than half of the respondents reported family ties as the foremost factor for immigration (Sutela & Larja, 2014). In addition, other self-reported causes for immigration included work, refuge, and studies. Similarly, family ties and work show up as important factors in official registration statistics from Finnish Immigration Service Migri. In 2019, Migri issued first residence permits on the basis of family ties for

10 251 third-country nationals, employment for 9 461 third-country nationals, and EU citizen registration for 8 533 EU-nationals. Among EU citizen registrations, employment is listed as the main cause for immigration. The other 9 409 residence permits were issued on the basis of studies, international protection, resettling of refugees and other causes (Migri, 2020).

Although located in the periphery, global crises, such as climate change, wars, and armed conflicts are already shaping, and are expected to continue to shape, migratory patterns to Finland (Hildén et al., 2016). During the migrant crisis of 2015, for instance, the number of asylum seekers increased substantially in all EU countries, and the largest groups of asylum seekers arriving to the EU were citizens of Syria, Afghanistan, and Iraq (Eurostat, 2016). The increase in humanitarian migration was visible in Finland too, as more than 30 000 applications for asylum were registered in 2015, with 63 % of the asylum seekers being Iraqi citizens (Migri, 2022a). Although the number of asylum seekers and refugees returned to average levels in the following years, the number of humanitarian migrants has increased sharply in 2022 following the Russian invasion of Ukraine in February. More than 23 000 applications for temporary protection under the Temporary Protection Directive of the European Union were registered in Finland by mid-May 2022, and more than 20 000 of the applications have been approved (Migri, 2022b). At this point, it is unknown for how long these humanitarian migrants will stay in the country.

In general, immigration is regarded as relatively undesirable in Finland. Although immigrants are regarded as useful to the country, immigration is still viewed more negatively than in other Nordic countries (Kallio et al., 2013). In recent years, however, attitudes towards workforce immigration have softened, and nearly half of the Finnish population assess that immigration is necessary due to the worsening demographic trends and their impacts on the public economy (Kurronen, 2021). Still, attitudes towards immigration and immigrants seem to be divided among the population as 41 % of the population believe immigration is doing more harm than good for the economy. Similarly, while more than half of the population assess that xenophobia and racist language have become daily occurrences in Finland, approximately 28 % disagree with the statement (Kurronen, 2021).

The negative attitude against immigration among the general population is reflected in how immigrants view the perception of themselves among native Finns (Nshom et al., 2022). The findings of Nshom et al (2022) indicate that immigrants believe that Finns have a negative attitude towards immigrants, and that Finns perceive immigrants as a threat to Finnish society and economy. Negative attitudes, such as these, and subsequent discrimination towards immigrants form a considerable barrier for integration all over Europe (Constant et al., 2009). Furthermore, several studies show that racist attitudes are prevalent in Finnish society (Kazi et al., 2019; Rask et al., 2018) and there is evidence of ethnic discrimination in the labor market (Ahmad, 2020) and in the healthcare system (Rask et al., 2018). Moreover, these studies show that all groups are not discriminated equally; immigrants and immigrant descendants with a non-European background are particularly vulnerable to discrimination, and of these persons of Middle Eastern and African background are the most vulnerable (Ahmad, 2020; Kazi et al., 2019). In addition to being detrimental to individuals on multiple levels, racism and discrimination pose a challenge the Nordic welfare model, which is fundamentally built on high equality and full employment across societal sectors (Greve, 2007).

Due to the construction of the Nordic welfare model (Greve, 2007), employment is a key factor for successful integration of immigrants. The labor market effects of immigration are well-researched, although the results differ somewhat between studies depending on the context, such as labor market structure and rigidity. Although seminal studies by Borjas (2003) and Card (2001) estimate that the wages of some native workers are lowered in the short-term, long-term effects on wage and employment have been found to be null or slightly positive (Edo, 2019). For an economy with an aging population and a depleting workforce, immigration is most likely needed to increase the workforce and employment as well as sustain future growth and the welfare system (Livi Bacci, 2018; Muysken & Ziesemer, 2011; Okkerse, 2008).

Overall, however, the employment rates among immigrants are lower than those among the general population in Finland (Eronen et al., 2014), and there are significant differences in the employment rates between different immigrant groups (Busk et al., 2016). Busk et al (2016) find that factors relating to gender, family circumstances, and economic conditions during the year of arrival all impact the employment rates among immigrants. For instance, they highlight that immigrants from the Middle East and Somalia have significantly worse outcomes on the labor market compared to European immigrants. The authors suggest that lower employment rates among some immigrant groups might be explained by past traumas that affect their ability to work in the long-term, referring to previous research by Castaneda et al (2015). Recent labor market research by Ahmad (2020), however, suggests that at least a part of the difference in employment rates is explained by ethnic discrimination. Other central factors that influence employment among immigrants include language barriers and labor market rigidity (Busk et al., n.d.; Maahanmuuttajien Työllistyminen, n.d.). Overall, however, immigration is viewed as an important aspect in improving the sustainability of the public economy in Finland, with the condition that employment rates among immigrant groups improve (Aalto et al., 2020).

While immigration patterns to Finland have changed substantially in the last thirty years, there is still more to learn about the healthcare impact of immigration. As the main aim of this thesis is to examine the effects of immigration on the healthcare market in Finland, focus now shifts to the Finnish healthcare system, which is presented in the following pages.

2.2 The Finnish healthcare system

Healthcare is viewed as an important part of the Finnish welfare system, and the right to healthcare is stated as a fundamental right in the constitution. Yet, several different factors, such as occupation, socioeconomic status, or place of residence, have a large impact on an individuals' access to healthcare services and the quality of healthcare is not uniform across the country (Keskimäki et al., 2019). The problems with the current healthcare system have been a political talking point for decades, and after several years of political efforts, the Finnish healthcare system is now under reform. In this section, however, the current healthcare system is introduced[2].

In Finland, healthcare is provided through three different service channels, consisting of the public healthcare scheme, private healthcare services and the occupational health system (Keskimäki et al., 2019). Of the three service channels, the public healthcare scheme is universally available to residents[3] in Finland and constitutes the main pillar of the Finnish healthcare system. The system is highly decentralized, as each municipality is responsible for organizing and financing public healthcare for its residents. As the municipalities may decide to provide healthcare services independently, jointly with other municipalities, or by outsourcing the services to private providers or other public actors, public healthcare is organized in different ways across the country. While there are minimum requirements on what the public healthcare scheme must offer, regardless of the actual provider, de facto services may vary depending on which municipality provides it. In addition to public healthcare services, private healthcare services and occupational health services are provided in parallel to services provided by the public healthcare system. In effect, however, access to these service channels is restricted. Use of private healthcare is limited to those who can afford to pay large out-of-pocket costs or private health insurance fees, and occupational healthcare services are only available to those who are employed, thus leaving out large segments of the population. Furthermore, the scope of services provided through occupational healthcare services varies from employer to employer. Thus the public healthcare system is the only service channel that is accessible to residents[4] without restrictions (Keskimäki et al., 2019).

[2] For a more thorough review, see Keskimäki et al., 2019.
[3] In this case, meaning all persons residing in the country. Illegal residents have a right to receive urgent medical care in the public healthcare scheme. Municipalities are not obliged to provide non-urgent medical care to persons with no right of residence (Sosiaali- ja terveysministeriö, 2022)

[4] Non-urgent healthcare services for asylum seekers are organized in reception centres. Urgent care is provided through the public healthcare system (Sosiaali- ja terveysministeriö, 2022)

The funding of healthcare[5] is largely fragmented (Keskimäki et al., 2019; Seppälä & Pekurinen, 2014). The public healthcare scheme is mainly financed publically through taxes, while a smaller part of the expenses is covered by out-of-pocket costs paid by healthcare users. Thus the quality of healthcare services is dependent on each municipality's ability to fund and provide healthcare services to its inhabitants. As municipalities vary greatly in size, financial stability and demographic structure, their ability to provide these services differ correspondingly. In fact, there is persistent regional inequality in the access to and quality of public healthcare services within Finland. Moreover, private healthcare services are mainly funded through user fees and voluntary private healthcare insurance. Although the users of private healthcare may apply for reimbursements from Kela, the reimbursements are comparatively small. Thus, the out-of-pocket payments for private healthcare are significantly larger than those for public healthcare services[6]. Finally, the occupational healthcare system is funded through mandatory national health insurance fees and employer fees. Out-of-pocket payments are not collected by the occupational healthcare services (Keskimäki et al., 2019; Seppälä & Pekurinen, 2014).

Among experts, there is large agreement that the decentralization and fragmentation of the Finnish healthcare system has led to various issues regarding unequal access to healthcare services, both regionally and socioeconomically (Erhola et al., 2020; Keskimäki et al., 2019; Seppälä & Pekurinen, 2014). In effect, the current healthcare system is three-tiered, and those with financial resources and employment have more options to choose from when deciding to seek medical care compared to those who are poor and unemployed. Despite its problems, mainly with accessibility to care and long waiting times (Keskimäki et al., 2019), the Finnish healthcare system fares well in international comparisons (Erhola et al., 2020). According to Erhola et al (2020), the overall quality of medical care is good and the

[5] For a more thorough review, see Keskimäki et al (2019) and Seppälä & Pekurinen (2014).
[6] Naturally, private health insurance reduces these out-of-pocket costs. However, attaining private health insurance entails, in itself, an additional cost.

results in some areas of special care, for instance cardiovascular disease, are outstanding. Compared to other EU countries, the healthcare system has also proven efficient, as health outcomes in relation to health spending are positive (Keskimäki et al., 2019).

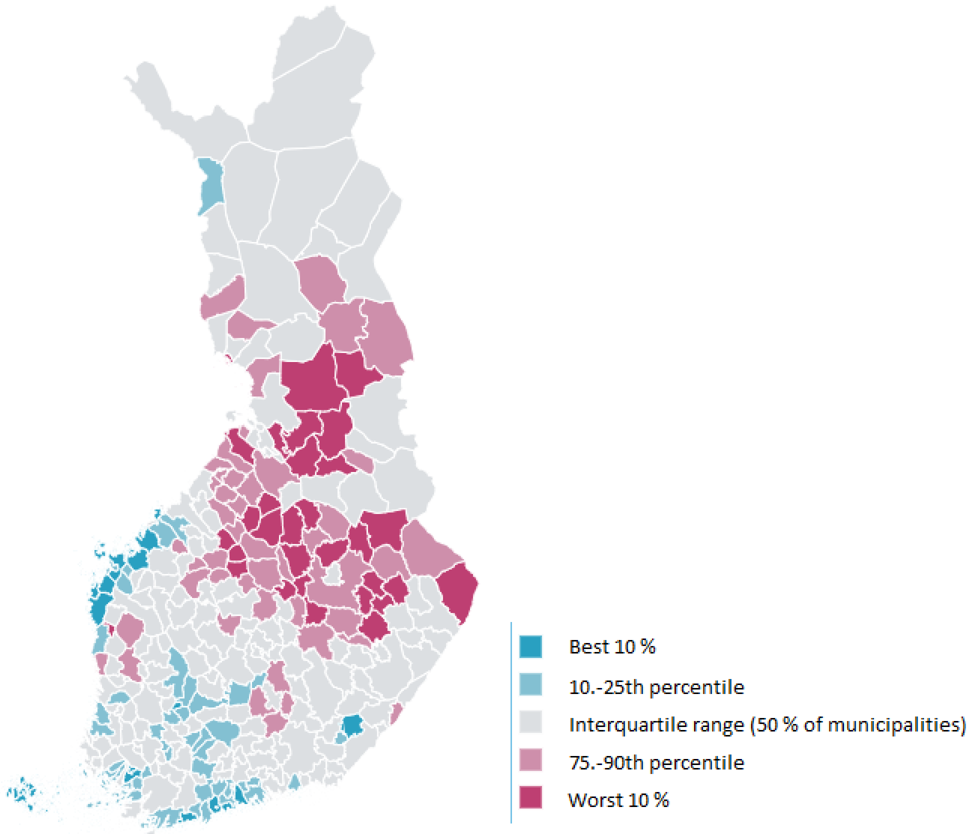

Figure 2. Regional differences in health expressed through THL's morbidity index. Source: THL's morbidity index (2022b).

Finally, the regional health disparities that are visible in Finland are shortly described. The regional differences in health are discernable in the morbidity index by the Finnish institute for health and welfare (THL), presented in figure 2. The morbidity index measures the rate of seven different groups of diseases in the population, which include common diseases such as cancer, coronary heart disease, and mental health problems, but also events such as accidental injuries. In the figure, the municipalities are arranged by color in percentile groups, and a higher index number indicates a higher level of morbidity. The figure shows, that the municipalities belonging to the 25th percentile are mainly located in the southern and western part of Finland, situated along the coastline and near larger regional centers. These municipalities are located in the NUTS 3-regions of Ostrobothnia, Pirkanmaa, Uusimaa and Southwest Finland. In contrast, the 75th percentile, describing municipalities with worse than average morbidity, are located in the central and eastern part of Finland. These municipalities are located in the regions of North Karelia, North Savo, Central Finland, Central Ostrobothnia, and North Ostrobothnia. The pattern has proven to be persistent over the years and should thus be taken into account in the empirical analysis.

As a short review of the healthcare system shows, a comprehensive assessment of the impact of immigration requires an analysis that takes the mix of public and private actors into account. Furthermore, the regional disparities in morbidity suggest that the empirical analysis should be designed so that regional inequality in health is considered in the model. Having discussed immigration and healthcare in Finland, the theoretical framework is presented in the next section.

3 Conceptual framework

In this section, the conceptual framework of the thesis is presented. As the purpose of the thesis is to examine how migration impacts the healthcare market in a receiving country, the theory discussed in the following pages concern both the migration decision and the fundamental mechanisms of healthcare markets.

3.1 The migration decision

Although there are a number of economic and social scientific theories that aim to explain migration flows between different regions, ranging from the gravity model to simple push- and pull-factor models, the neoclassical human capital theory of migration is likely the most frequently used theoretical framework in economic research. The theory focuses on an individuals' migration decision, thus adopting a micro level perspective on migration issues. As two fundamental concepts that form the hypotheses used in this thesis are rooted in the human capital theory of migration, it is presented briefly below.

In short, the human capital theory of migration states that individuals will migrate if the net benefits of migrating outweigh the costs of doing so. In its simplest form, the costs and benefits are calculated in a single period model and the calculation is performed with an individual's perspective in mind. Although several alterations of the model are possible, such as including intertemporal migration and changing the decision maker from an individual to a family unit (Bodvarsson et al., 2015), only a single period- and single individual model according to Borjas (2016) is presented. In essence, the human capital theory of migration states that individuals will migrate if the present value of future earnings in the destination region exceeds the present value of future earnings in the origin region, when the costs of migrating are accounted for. This can be written as the following equation:

$$\pi = PV^{destination} - PV^{origin} - C$$

where π stands for the net gain of migration, $PV^{destination}$ stands for the present value of all future earnings in the destination country, PV^{origin} stands for the present value of all future earnings in the origin country and C stands for all of the costs that are involved with migrating. An individual will only migrate if the net gain of migration is positive, i.e. $\pi > 0$. In the model, it is assumed that individuals have perfect information and are able to approximate the present value of future earnings in each place and the costs involved with migrating. As such, the present value of earnings is calculated as a function of wage (Borjas, 2016).

Although simple, the human capital model of migration provides a useful framework for understanding an individual's migration decision both within and across nation borders. In the next section, focus shifts on international migration exclusively and the human capital model is further elaborated into the migration model of initial health selectivity, which implies that those who migrate are actually healthier than the general population.

3.2 The initial health selection model of migration

The initial health selection model of migration is an attempt to theoretically explain the strong empirical evidence behind the healthy immigrant effect[7]. As mentioned above, the initial health selection model of migration is based on the human capital theory of migration. The following model of initial health selectivity is presented according to Jasso and Massey (2004) and is focused on international migration.

According to Jasso and Massey (2004), there is a simple reason as to why migrating across borders is often more costly than moving within a country. For one, the monetary cost of moving often increases when the distance between origin and destination countries grows further. More importantly, however, there are additional costs

[7] Describes the situation when observed health among newly arrived immigrants is comparatively better than that of the general population. The healthy immigrant effect has been observed empirically in several different studies examining immigration and health (see chapter 4).

involved with moving abroad, as migrating across borders often includes having to adapt to a different culture, to unfamiliar legislation, and perhaps even to a new language. In some cases, the destination country is a completely new environment for the migrant, who leaves family, friends, and other social ties behind. With this in mind, it is reasonable to assume that individual characteristics, such as health, might influence a migrant's decision to migrate or stay in their country of origin (Jasso & Massey, 2004).

Jasso and Massey (2004) argue that initial health levels influence a migrant's decision in two separate ways. They propose that initial health levels have an effect on both the costs of moving and on the migrant's ability to earn income in the origin and destination countries. With the simple model of human capital migration presented earlier as a starting point, Jasso and Massey rewrite the migration decision as follows:

$$w_d k_{id} l_{id} - w_o k_{io} l_{io} > c_{od},$$

so that w_d and w_o stands for a country specific price of skill in destination and origin country, k_{id} and k_{io} stands for an individual's (i) skills in each country and l_{id} and l_{io} for the labor supply (or skill utilization) in each country. The costs of moving from origin to destination is represented by c_{od} and they include both monetary and intangible costs, such as leaving your family behind. In this model, the income in origin and destination is described by the functions $w_o k_{io} l_{io}$ and $w_d k_{id} l_{id}$ respectively, *i.e.* total income in each country depends on individual traits of the potential migrant and the labor market conditions in these countries. Similarly, as before, an individual migrates if the net benefits of moving outweigh the costs of doing so. Thus far, this model follows the logic of the simple human capital model of migration presented earlier. However, when the concept of skill transferability is introduced the equation changes (Jasso & Massey, 2004).

Jasso and Massey (2004) assume that skills are not transferred one to one between countries, a reasonable assumption when international migration is considered, as language, culture and laws might differ across borders. They describe this through the following equation: $k_{id} = \alpha_o k_{io}$, where α_o represents an "*index of transferability*" from the origin to the destination country. The index α_o varies from 0-1, with perfectly transferable skills providing an index of $\alpha_o = 1$. In addition, they describe the skill price relation across the origin and destination country as $w_o = \beta_d + \beta_o w_d$. They then rewrite the labor supply relation across origin and destination country as $l_{id} = c_o l_{io}$, similarly as the skill transfer relation. Substituting these conditions into the original equation allows it to be stated as follows:

$$w_d k_{io} l_{io} \left(\alpha_o c_o - \frac{\beta_d}{w_d} - \beta_o\right) > c_{od}.$$

The basic function of the model is similar as previously, *i.e.* an individual migrates if the benefits of migrating outweigh the costs of doing so.

According to Jasso and Massey, being healthier increases individual earning capacity, thus making migration a more worthwhile option. They state that good health is not only correlated with a higher level of human capital k_{io}, but also with individual labor supply l_{io}. Differently put, a healthy individual is more capable of working longer hours, or more effectively than one in poor health, thus earning more income. As both k_{io} and l_{io} increase with good health, healthy individuals are able to earn more and consequently gain more from migrating. This, in turn, implies that migrants are positively self-selected on health. Furthermore, the model suggests that migrant self-selection is influenced by the costs of migration, skill transferability and skill price relations. The more transferable skills are (when α_o is larger) the less health matters for the migration decision. The same applies for skill price relations, *i.e.* if wages are much larger in the destination country in comparison with the origin country, health has less influence on the migration decision. However, when the costs of moving are greater (c_{od}) or when skill transferability (α_o) is low, migrants will be more positively selected on health. With all this in mind, Jasso and Massey conclude that immigrants must have an initial health level that is large enough for migration to be worthwhile all together (Jasso & Massey, 2004).

It is worth noting, that this model considers labor market immigration. Jasso and Massey (2004) point out that wage differences, skill transferability, and the levels of human capital and labor supply might not be as important for older migrants. In addition, they conclude that the quality of healthcare may be incorporated in the model, suggesting that more affordable and more readily available healthcare in the destination country would induce more migration, while the marginal migrant would be less healthy. Nevertheless, the theoretical framework presented by Jasso and Massey suggests that migrants are positively selected on health. The magnitude of the selection, however, is dependent on several different factors, such as the distance between the destination and the origin countries. The longer the distance, the healthier the migrant must be.

In summary, the initial health selection theory suggests that per capita healthcare expenditure in destination countries decreases when immigration increases. This prediction relies on the assumption that, as migrants are healthier than the general population, they require less healthcare services. In contrast, the welfare magnet theory that is presented in the next section, suggests that the opposite might be true.

3.3 The welfare magnet theory and demand for healthcare

The welfare magnet theory is based on Borjas's seminal article on migration and welfare in the United States (Borjas, 1999). It, too, is an extension of the human capital theory on migration, and, as such, rests on the neoclassical assumption of utility maximizing individuals and rationality. Likewise, the welfare magnet theory builds on the assumption of self-selection, albeit from a different angle. In the model, immigrants are viewed as a self-selected group when it comes to willingness to pay; as migration is costly, only those who are willing to pay the price for moving abroad will eventually migrate.

In Borjas' seminal article, a theoretical scenario of immigration to the United States of America is analyzed from different individual migrant's perspectives (Borjas, 1999). Both high- and low-skilled individuals are among the group of theorized migrants, all of whom are willing to pay the price of migrating to the U.S. from abroad. In accordance with the neoclassical framework, the migrants choose to locate in a state that maximizes their total utility. In the theoretical case, Borjas' assumes that the cost of migrating is fixed, *i.e.* all migrants pay an identical price for moving to the United States regardless of which state they choose to settle in. When migration costs are fixed in this way, Borjas argues, rational migrants will cluster in states with higher welfare benefits, as those are the locations that maximize their utility. Given a choice of locating in state A and state B, a rational individual locates in state B, if the net gain of migrating to state B is larger than that of migrating to state A, *i.e* if $\pi_A < \pi_B$, given that

$$\pi_A = PV^{destination_A} - PV^{origin} - C_A$$
$$\pi_B = PV^{destination_B} - PV^{origin} - C_B.$$

According to Borjas, this is particularly true for low-skilled migrants since the welfare benefits provide a safety net in case of unemployment. In fact, Borjas claims that the geographical distribution of migrants between states will be similar to what the distribution of natives *would be* if there were no costs of moving between states, *i.e.* migrants will be negatively selected to states where welfare benefits are higher. In the theoretical model, it is assumed that there are fixed costs for migrating between states for natives living in the U.S., which hampers within-borders native migration in pursuit of higher welfare benefits (Borjas, 1999).

As with the human capital theory of migration, the welfare magnet theory is mainly a theory on labor mobility, and the migrant chooses their migration destination by maximizing utility. Although utility is often simply interpreted as total income, hypothetically, utility could include welfare services, such as subsidized healthcare. For instance, if a migrant is in permanent need of medication that is heavily subsidized in one state and not the other, migrating to the state where medical expenses are subsidized is a way of maximizing net available income for said migrant. Naturally, as the welfare magnet theory is first and foremost focused on labor mobility, it states no predictions about the health status of arriving immigrants. However, it is reasonable to assume that if healthcare is viewed as an important part of the welfare system in countries where the public healthcare system is extensive, it will add to the "welfare magnet" effect, attracting migrants that are less healthy and in need of more healthcare services. If so, increased migration could result in increased per capita healthcare expenditure[8].

3.4 The quirks of healthcare markets

Having discussed theories on migration and their implications for the health levels of migrants, in this section, the healthcare market and the factors that differentiate it from other markets are introduced. Furthermore, theories on the intersection of public and private actors in the healthcare market are presented. Finally, the role of waiting lists and the mechanisms of crowding out in the healthcare market are explained.

First, it is widely accepted in economic literature that healthcare markets do not fulfill the conditions of perfectly competitive markets. Arrow (1963) was among the first to discuss the special characteristics of healthcare markets, or medical markets as they are called in his 1963 article. For Arrow, healthcare markets are mainly characterized by asymmetric information. For one, risks involved with undergoing, or not undergoing, medical procedures or treatments are difficult, if not impossible, to assess as a non-medical professional. This gives medical care providers the informational upper hand in transactions as patients and relatives simply have to trust that physicians are guided by the patients' interests, and not their own, when providing medical care. In addition, healthcare markets are characterized by uncertainty. Demand for healthcare is unstable as it cannot be foreseen when, for instance, a car accident that requires major trauma response will happen, and in a similar manner, we cannot accurately predict who will get cancer and need extensive chemotherapy. All of this makes resource allocation in the medical market difficult (Arrow, 1963). Although Arrow (1963) identifies information and uncertainty as the main causes

[8] In the article from 1999, Borjas assumes that migrants are self-selected on willingness to pay and does not consider initial health levels. In this framework, it is assumed that willingness to pay is not correlated with initial health levels.

that differentiate healthcare markets from regular competitive markets, other factors are highlighted as well. For instance, Arrow notes that the provision of healthcare is restricted by medical licensing, which creates a limited supply of healthcare providers on the market. Furthermore, healthcare markets are distinguished by the interplay of public and private actors, both when it comes to the financing of services and provision of them. In a mixed market where healthcare is provided by both public and private actors, these will often operate on slightly different terms as the public actors are usually heavily subsidized, while the private ones are not (Barros & Siciliani, 2011). In such markets, private actors may offer duplicative services, at a higher cost, or complementary services that are not otherwise provided in the market (Barros & Siciliani, 2011; Dranove, 2011). For this thesis, the overlap in duplicative services is of particular interest as public healthcare spending and the impact of a possible crowding out phenomena are studied.

3.5 Consumer choice in a mixed healthcare market

Now a simple framework of the consumer choice in healthcare systems with both public and private providers is presented according to Barros and Siciliani (2011). The services offered by private providers can be either duplicative or complementary to the services provided by the public healthcare system. Here, the duplicative case as presented by Barros and Siciliani (2011) is considered. In the case when duplicative healthcare services are provided, consumers in need of medical care are faced with two choices: utilizing public healthcare services for a minor cost or paying a larger price to utilize private healthcare. Barros and Siciliani (2011) describe the consumer choice mathematically as follows:

$$V(\alpha^{pr}) - V(\alpha^{pu}) + g(w^{pr}) - g(w^{pu}) + v(q^{pr}) - v(q^{pu}) > U(\gamma) - U(\gamma - p),$$

where α represents the level of amenities, w denotes waiting time, q stands for the quality of healthcare and γ represents household net income. The out-of-pocket cost of utilizing private healthcare services is denoted by p. The subscripts pr and pu

indicate whether the services are offered by private or public providers. The notations *V, g, v* and *U,* respectively, are functions, representing the utility of each variable (Barros & Siciliani, 2011).

In the framework, it is assumed that utility increases when amenities α, quality q, and household income γ increase, while waiting times w decrease utility. It is assumed that private healthcare providers can offer consumers more amenities ($\alpha^{pr} > \alpha^{pu}$) and a shorter waiting time ($w^{pr} < w^{pu}$). Naturally, the consumer chooses to utilize private healthcare services only if the gains from higher amenities and a shorter waiting time are larger than the loss of utility from having to pay the additional price of using the services. As consumers differ in their willingness to pay the additional price p, only those who have a high willingness to pay will choose to utilize private healthcare services. In addition to providing duplicative healthcare services, private healthcare providers can offer complementary private care for procedures that are not covered by the public healthcare scheme (Barros & Siciliani, 2011). In such cases, the consumer has no other option but to pay the price for private healthcare if they wish to be treated. Which procedures and treatments are offered as complementary private care thus depends on which kind of care the public healthcare scheme covers (Barros & Siciliani, 2011).

In addition to the price, the quality of care, the level of amenities and the amount of waiting time in each sector influence the consumer decision to choose a healthcare provider (Barros & Siciliani, 2011). Of these, waiting time is of particular interest, as it serves as a non-monetary price that influences consumer choice, and consequently alters market allocation (Barros & Siciliani, 2011; Hoel & Sæther, 2003). While out-of-pocket payments for public healthcare services are fixed in the short term, waiting times are not. Thus, in a system where the out-of-pocket costs for public healthcare services are set in advance and do not react to changes in demand, waiting time will steer customers, with a large enough willingness to pay in order to skip the queue, from public to private service providers. For the public sector, waiting time thus acts as a pressure vent, through which excess demand is steered to the private healthcare providers and through which public healthcare costs are contained (Hoel & Sæther, 2003). In fact, waiting times in the public sector seem to be inversely related to private healthcare, *i.e.* waiting times are longer when the private sector offers duplicative healthcare services (Barros & Siciliani, 2011; Duckett, 2005; Hoel & Sæther, 2003). Furthermore, a link between longer waiting times and increased demand for private health insurance has been established empirically (Jofre-Bonet, 2000). In other words, as waiting times increase in the public healthcare system, more consumers, who previously would have preferred to use public healthcare services at a negligible cost, are willing to pay the extra price to wait less (Barros & Siciliani, 2011).

In conclusion, theory on consumer choice in mixed healthcare markets suggests that some consumers are crowded out from public healthcare services to healthcare provided by private actors when waiting times increase. Thus, when analyzing the question of how migration impacts the healthcare market, it is important to consider how healthcare is organized in the receiving country, in addition to analyzing the demand for healthcare among immigrants. In mixed healthcare market systems with duplicative healthcare, increased demand for healthcare may well cause a crowding out effect, if the increase in demand results in longer waiting times within the public healthcare system. While the initial self-selection theory on migration does not predict an increase in demand for healthcare due to immigration, the welfare magnet theory suggest that it is possible.

Having laid out the theoretical framework, previous research on migration, health, and welfare is now reviewed in chapter 4. Then, in chapter 5, some hypotheses are formed drawing on theory, previous research, and information of the Finnish context.

4 Previous research on migration and health

In this chapter, previous literature on migration, health and healthcare is reviewed, beginning with the healthy immigrant effect and the effects of immigration within the healthcare system. Finally, some Finnish studies are presented.

4.1 The healthy immigrant effect

First, previous research on the healthy immigrant effect (HIE) is presented. The HIE describes the phenomenon of newly arrived immigrants having a significant health advantage compared to the native population of their new home country. The initial health selection model, which is presented in chapter 3, is aimed at explaining this phenomenon.

Many of the studies identifying a HIE are conducted in the United States, Canada, and Australia (Kennedy et al., 2006; Markides & Rote, 2019; Ng, 2011). The empirical evidence is less conclusive for European countries, as there are several studies which show little to no support for the phenomena (Greve, 2016; Moullan & Jusot, 2014; Nolan, 2012). For instance, in a cross-national study, Moullan and Jusot (2014) analyze the differences in self-reported health levels between native and immigrant populations in France, Belgium, Spain and Italy. In France, Belgium, and Italy, their results show that self-reported health is poorer among immigrants compared to the native population, showing no support for a HIE. In Italy, however, the findings are contrary, as immigrants declare higher self-reported levels of health compared to the native population. The authors suggest that the difference in results is due to health selection pre-migration, while simultaneously pointing to differences in integration of immigrants between the European countries (Moullan & Jusot, 2014). In another cross-national study examining the Nordic countries, Greve (2016) fails to confirm the existence of a HIE among immigrants to the Nordic countries. In the study, health status between natives and immigrants is analyzed by comparing different measures, such as life expectancy, admissions to hospitals and effective access to treatment. Greve finds no systematic correlations between ethnicity and health, while emphasizing that immigrants often live in poorer conditions, which in itself is correlated with poorer health outcomes. Furthermore, Greve notes that there is noteworthy inequality in healthcare use between natives and immigrant groups in the Nordic countries. Some caveats apply, however, as data on ethnicity or immigration status is not always available and healthcare systems between Nordic countries differ, although the welfare regimes of the counties are similar (Greve, 2016).

Although some studies have failed to identify a healthy immigrant, other studies have found support for the premise. By comparing birth outcomes among Ecuadorians who migrated to Spain in the early 2000's with birth outcomes of non-migrant Ecuadorians and other migrant groups in Spain, Farré (2016) finds that birth outcomes among migrated Ecuadorians are significantly better than birth outcomes among the other groups. Farré argues that the phenomenon is explained by self-selection in Ecuador, *i.e.* that the mothers who migrated were healthier than those who stayed behind in Ecuador, thus suggesting that there is a significant health advantage among newly arrived immigrants. Moreover, the results suggest that positive self-selection increases with geographical distance (Farré, 2016). Differences in health advantage across immigrant groups by country of birth and even by gender is further corroborated by evidence from Canada (Ng, 2011). By analyzing self-reported health levels in France, Ichiou and Wallace (2019) identify a healthy immigrant effect, particularly among males. Ichiou and Wallace attribute a large part of these health differences with relative educational attainment, *i.e.* the education level migrants attain in their country-of-origin pre-migration. Their results suggest that immigrants are self-selected on education, which in turn explains the observed health advantage in their destination countries (Ichou & Wallace, 2019).

The differences in results across these studies may, in part, be explained by the timeframe. Although identifying a healthy immigrant effect, several studies have suggested that the initial health advantage among immigrants decreases with time (Bedard & Antecol, 2006; Chiswick et al., 2008; Gotsens et al., 2015; Ng, 2011; Vang et al., 2017). This decrease is, among other things, attributed to changes in lifestyle (Bedard & Antecol, 2006) and socioeconomic disadvantages (Gotsens et al., 2015). On the other hand, a longitudinal study of health levels in the United

States shows that although health deteriorates among immigrant groups, the decrease in health levels is still slighter than among the non-immigrant population (Lu et al., 2017). Furthermore, studies show that migration policy in the destination country is an important determinant of the size of the potential health advantage among immigrants. Comparing health levels of immigrants and native populations, 50 years of age and older, in Israel and several European countries, Constant et al (2018) finds that immigrants to Israel have a significant health disadvantage compared to the general population. For European countries, the authors report a health advantage among immigrant populations. In the study, health is measured, among other things, through self-reported health and the number of consumed prescription drugs. According to the authors, the disparity is explained by different immigration policies; while many European countries have policies that limit immigration based on economic factors, Israel encourages Jewish people and their descendants to migrate to Israel without restrictions (Constant et al., 2018). Further evidence pointing to the significance of policy is presented by Chiswick et al (2008), as their results show that self-reported health levels among immigrants are correlated to immigrant visa-categories. Refugees, for instance, have worse self-reported health levels than immigrants in other visa-categories. Their results show that factors that determine the visa status of immigrants are, at least somewhat, correlated with the initial health status of immigrants as they arrive in the country. With time, however, self-reported health levels seem to converge to the median of the general population (Chiswick et al., 2008).

Although well-documented in some countries with sharp migration policies, such as the United States, Canada, and Australia, the evidence of a HIE in European countries is inconclusive. While migration policy clearly matters for the healthy immigrant effect, previous research also shows that the health advantage among newly arrived immigrants converges to the mean with time. As socioeconomic status seems to be correlated to health, integration policy plays an important role in maintaining good health among all segments of the population, including immigrants and their children. Having reviewed studies on immigrant health levels, the interaction between different healthcare systems and immigration is now examined.

4.2 Immigration and the healthcare system

In this section, research on immigrants' use of healthcare services and the effect of immigration on the healthcare system itself is presented. The literature next presented consists of review studies, theoretical literature, and empirical research. The studies show that there are large disparities in healthcare use between different countries, further supporting the notion that migration effects are context-bound, both with regards to migration flow and healthcare system design.

First, immigrants' access to and use of healthcare services are examined. In a review study summarizing the results of 36 different publications, Sarría-Santamera et al (2016) find that immigrants use health services with an equal or a slightly lower frequency than the general population. The majority of the publications reviewed by the authors examine healthcare use in European countries, and concern different kinds of healthcare services, such as mental health services and primary care. Although the use of healthcare services among migrants is equal to or lower than that of the general population, the authors find significant variation in the use of healthcare services among migrant subpopulations, partly due to differences in income, length of stay or levels of language fluency (Sarría-Santamera et al., 2016). A more detailed picture of healthcare use among migrants emerges, when empirical studies concerning individual countries are reviewed. A study utilizing cross-sectional data from the National Health Survey in Spain (Carrasco-Garrido et al., 2007) concludes that immigrants lead healthier lifestyles and consume fewer medical drugs than the native population in Spain, yet hospitalization is slightly more common among migrants than among the rest of the population. Although the authors find no evidence suggesting that the use of healthcare services is excessive or abused among the migrant population, they provide no explanation as to why hospitalizations are more common among migrants. Similarly, a slightly higher than average use of healthcare services is found in Denmark (Nielsen et al., 2012). Nielsen et al (2012) find that the use of free healthcare services among immigrants is slightly higher than among ethnic Danes while the use of services requiring co-payments, such as dental health services, is slightly lower. According to Nielsen et al. (2012), the differences in healthcare use cannot be solely explained by differences in health status, and list poor quality of services, insecurity due to inadequate communication between patient and medical professional, or differences in consumer behavior as potential explanations. The authors note that further research is needed to accurately establish why these distinctions exist in Danish society (Nielsen et al., 2012).

Although the use of healthcare services appears to be slightly higher among immigrants than the rest of the population in Denmark and Spain (Carrasco-Garrido et al., 2007; Nielsen et al., 2012), results from the United States show remarkably different results. When comparing healthcare expenditure among immigrants and the rest of the population in the U.S., Mohanty et al (2005) find immigrants' per capita expenditure on healthcare to be 55 % lower than the non-immigrant population's (Mohanty et al., 2005). A possible explanation to such large disparities between estimates in these countries is the design of the healthcare system. This idea is further supported by a study conducted by Siddiqi et al (2009), in which immigrants' access to healthcare in the United States is compared to their access to similar services in Canada. The results indicate that the healthcare system in the United States, and particularly the lack of healthcare insurance among immigrants, largely explain the disparities in healthcare access between immigrant and U.S-born populations (Siddiqi et al., 2009).

Another way of assessing the effects of immigration on the healthcare system is by analyzing waiting times or healthcare expenditure, as this thesis does. In a study on the effects of immigration on the National Health Service (NHS) in England, immigration is found to not have an effect on waiting times in accident and emergency departments or elective care (Giuntella et al., 2018). In fact, the authors show a reduction in waiting times for outpatient referrals in most areas when immigration increased. Although some deprived areas outside of London proved to be an exception, the positive effect disappeared within a few years' time. According to the authors, the increased waiting times in deprived areas are explained by the combination of a healthy immigrant effect and internal migration. They suggest that increased immigration to any area will spur out-migration of the non-immigrant population. Yet, as non-immigrants in deprived areas have limited mobility, and deprived areas in general tend to attract less-healthy immigrants, less-advantaged groups will cluster in these areas. As these deprived areas then inhabit proportionally more disadvantaged groups of people than wealthier areas, mirrored in the demand for healthcare services, waiting times for healthcare services grow longer. In general, however, the authors note that increased immigration due to the EU enlargement in 2004 did not have adverse long-term effects on waiting times in the NHS, in fact, in most areas waiting times reduces due to immigration (Giuntella et al., 2018).

Finally, not many studies have focused on examining the effects of immigration on public healthcare spending. In an article from 2020, however, Bettin and Sacchi (2020) analyze the effects of immigration on healthcare expenditure in Italy. The results of Bettin and Sacchi suggest that migration lowers healthcare expenditure by 3.8 % for every one percentage point increase in the share of immigrants. Furthermore, they find no evidence to suggest a crowding out effect among the native population. Bettin and Sacchi explain the effects by the healthy immigrant effect and by the composition of the migrant population, which is mostly male and of working age. In addition, the authors suggest that language barriers might hinder some migrants' access to healthcare services, and as such explain a share of the negative impact on healthcare expenditure. The study conducted by Bettin and Sacchi in 2020 is of particular interest for this thesis, as the same research questions are examined, albeit in a Finnish context. The methodological approach and the results obtained by them are thus further explained and compared to those of this thesis in subsequent chapters. Finally, before summarizing theory, previous research and the research setting to form the hypotheses, some studies on immigration and health from Finland are discussed.

4.3 Finnish studies

Nearly all of the previous research presented thus far have been conducted in other countries, both culturally and structurally different from Finland. In this subchapter, a small overview of studies in a Finnish setting is presented.

A study from 2006 shows that immigrants use less basic and specialized healthcare services compared to the non-immigrant population (Malin et al., 2006). When analyzing costs by group, they conclude that basic healthcare costs are approximately 5 % lower among immigrants when age and gender is accounted for, suggesting a significantly lower use of those services. Furthermore, the authors find that prevalence of illness is lower among immigrants than the general population. However, the authors are not able to explain why the prevalence of illness or use of healthcare services is different in the immigrant population compared to the native group. As such, they cannot rule out issues regarding accessibility as part of the explanation (Malin et al., 2006). More recent studies have found that immigrants in Finland tend to use healthcare in a similar manner as the non-immigrant population (Castaneda et al., 2015; Nieminen et al., 2014).

Yet, there are differences in the patterns of healthcare use between immigrant groups as well as between the use of different kinds of healthcare services. For instance, among some immigrant populations, there is overuse of emergency services, while preventive healthcare services and cancer screening services are underused in other groups (Koponen et al., 2016). In addition, research has shown that there are discrepancies in assessed health and the use of healthcare among some migrant groups (Castaneda et al., 2015; Mölsä et al., 2019; Nieminen et al., 2014). Although there is a higher prevalence of mental health issues among immigrants of Middle Eastern and Northern African origin, immigrants from these groups do not use mental health services in a higher degree, thus suggesting that there is an unmet need for mental health services in this group (Castaneda et al., 2015; Nieminen et al., 2014). Similar results are obtained by Mölsä et al, studying mental health in elder Somalis (Mölsä et al., 2014, 2019). While migrants and migrant descendants report of inaccessibility to medical services slightly more often than the general population (Kazi et al., 2019), self-reported health among migrants is better than among the general population (Nieminen et al., 2014). In general, self-reporting indicates that women have a higher need for healthcare services, which is most likely explained by care related to pregnancy- and childbirth (Kazi et al., 2019).

Finally, there is some evidence of access barriers in the Finnish healthcare system. These include language barriers, difficulties in communication, lack of cultural knowledge and discriminatory attitudes among healthcare personnel (Alitolppa-Niitamo et al., 2013; Koskimies & Mutikainen, 2008). The importance of eradicating discrimination, and further enhancing social well-being of immigrants, is emphasized by research which shows odds of poor self-reported health increasing with experienced discrimination (Rask et al., 2018) and social indicators, such as having friends, being linked to better health outcomes (Kazi et al., 2019).

5 Hypotheses

In this chapter, the hypotheses are formed by combining what is known about health and migration in the Finnish context with economic theory and previous research. Having formed the hypotheses, chapters 6-8 are then focused on the methodology and the empirical analysis of the thesis. Lastly, conclusions are drawn in chapter 9.

Beginning with the theories on migration, two different conclusions of the initial health levels of migrants arriving to a destination country are offered. The initial health selection theory (Jasso & Massey, 2004) suggests that migrants are healthier than the general population while the welfare magnet theory (Borjas, 1999), although not concerning health in itself, suggest that welfare states, such as Finland, will attract migrants that are relatively low-skilled and thus in poorer health. Either of these theories are applicable to the Finnish context. In an international comparison, the welfare model in Finland is generous and the quality of healthcare is good. On the other hand, within the EU and even the Nordic countries, Finland is located in the periphery. As such, the supposed welfare magnet of Finland might be smaller than that of other neighboring countries. Furthermore, a location in the periphery increases the cost of migration, which, according to the initial health self-selection theory, requires a higher level of initial health. Thus, in order to form the hypotheses, previous research is briefly summarized and considered.

First, the evidence of a healthy immigrant effect in Europe is mixed (Farré, 2016; Greve, 2016; Ichou & Wallace, 2019; Moullan & Jusot, 2014; Nolan, 2012). As such, it is useful to consider immigration policy, as previous studies have found it to be an important factor in determining health levels among immigrants (Constant et al., 2018). For instance, in Australia, health status of immigrants varies according to visa categories, so that self-reported health among economic migrants is higher than among the general population while self-reported health among humanitarian migrants is lower than among natives (Chiswick et al., 2008). Although it is unclear whether similar correlations as shown by Chiswick et al. in Australia exist between health levels and the stated reason for attaining residence permit in Finland, it is reasonable to assume that this is the case. For instance, it has been shown that health levels of refugees are worse than among the general population in Finland too

(Mölsä et al., 2014). Previous studies identify family ties and work as the most common reasons for migrating to Finland, while humanitarian migrants only represent a small part of the total inflow of migrants[9] (Migri, 2020; Sutela & Larja, 2014). This suggests that health levels among immigrants are on par with, or even better than, those among the general population.

While theory, previous research, and data on the migrant composition suggest that health levels are better among the immigrant population than among the non-immigrant population, the implications for healthcare expenditure depend on the relationship between health and the need for healthcare. Although there is substantial evidence that human capital and health outcomes are positively correlated (Cutler & Lleras-Muney, 2006), it does not directly imply that the correlation between health spending and human capital is negative. In fact, the opposite might be true, as data shows that high-income groups[10] are more frequent users of healthcare services compared to low-income groups when data is adjusted for the need of healthcare services (Manderbacka et al., 2017). In Finland, immigrants tend to be socioeconomically disadvantaged. Examining the migrant population shows that immigrants have a lower level of disposable income (Ruotsalainen, 2015) and a higher level of unemployment than the general population (Eronen et al., 2014). Although there are substantial differences in the employment rates between different immigrant groups (Busk et al., 2016), a large segment of the immigrant population has a lower socioeconomic status in society. While there are differences in the patterns of use across the immigrant population (Koponen et al., 2016), as a group, immigrants tend to use healthcare services slightly less (Malin et al., 2006) or in a similar manner as the non-immigrant population (Castaneda et al., 2015; Nieminen et al., 2014), suggesting that the use of healthcare services among immi-

[9] As the substantial increase in humanitarian migrants in one year during the research period was mainly in the number of asylum seekers, whose non-urgent healthcare is organized through reception centers, their impact is not expected to be seen in the public healthcare system.
[10] Human capital theory suggests that wages increase as human capital accumulates.

grants follows a similar pattern as that among the general population when socio-economic status is accounted for. All of this suggests that immigration will have little to no impact on the demand for healthcare services during the research period.

In order to examine the complete impact of immigration on the healthcare market, it is necessary to examine the provision of both public and private healthcare. While the Finnish healthcare system relies on three different service channels, the general duplicative framework provided by Barros and Siciliani (2011) is still applicable to the Finnish context, since the occupational healthcare system excludes large segments of the population. For groups such as families with children, the elderly and the unemployed, the choice between different healthcare providers remains within the duplicative framework. Even when being reimbursed by the publicly funded social insurance institution Kela, the out-of-pocket cost of using private healthcare services is significantly higher than the out-of-pocket cost of using public healthcare services. The fact that immigrants, in general, have higher rates of unemployment (Eronen et al., 2014) and lower levels of disposable income (Ruotsalainen, 2015) suggests that the public healthcare system is their primary service channel for healthcare services. Any effects on the healthcare market are thus likely to originate in the public healthcare system, but not limited to it. If migration increases demand for public healthcare with the consequence of longer waiting times, crowding out to private healthcare services is expected to happen.

Finally, on the basis of previous research, the conceptual framework, and data on immigration to Finland, the hypotheses are formed. As previous research from Finland has shown that the use of healthcare services does not differ drastically between migrants and the non-migrant population in Finland (Castaneda et al., 2015; Nieminen et al., 2014), an increase in immigration is not expected to have a large impact on public healthcare expenditure. In fact, depending on the demographic composition of the migrants, the per capita impact might even be negative. As a consequence, it is deemed unlikely that a crowding out effect in the healthcare market takes place with increased immigration. Thus, the following hypotheses are formed:

i) Public healthcare expenditure per capita decreases or remains unchanged when immigration increases.

ii) Immigration does not have a significant impact on the number of individuals who are reimbursed for use of private healthcare services.

The first hypothesis, concerning the overall demand for healthcare, is related to the initial self-selection theory on health and the welfare magnet theory. The second hypothesis, concerning the impact of changes in the overall demand on the healthcare market due to the structure of the healthcare market, relies on the consumer choice framework provided by Barros and Siciliani (2011).

Thus far, migration and healthcare have been analyzed on a general level, both theoretically and by scrutinizing previous research and data. Henceforth, the analysis concerns migration and healthcare in a Finnish setting specifically. The following chapters are devoted to research design, data, and the empirical analysis.

6 Data and methodology

Having discussed theory and formed the hypotheses, focus now shifts to data and methodology. First, data and variables are presented, after which the methodology of the thesis is thoroughly discussed. Finally, diagnostics are performed to prove the suitability of the empirical model. The empirical analysis is conducted by utilizing cross-sectional panel data across NUTS 3-regions in Finland. All data is collected for the years 2010-2019.

6.1 Data and variables

As the focus of this thesis lies on analyzing the effects of immigration and healthcare expenditure, the main variable of interest describes public healthcare expenditure on regional level. In addition, a variable measuring the use of private healthcare is needed to analyze a potential crowding out effect. The dependent variables in this thesis are thus given by data on operating net expenditure on primary healthcare and by reimbursements for medical expenses, provided by the Social Insurance Institution of Finland (Kela). Several control variables, similar to those utilized in the research of Bettin and Sacchi (2020), are introduced in the empirical model to enhance its validity. The data and variables are described in more detail below, with the names of the variables disclosed in parentheses.

The indicator **operating net expenditure on primary healthcare, euro per capita** ($expenditure$) is retrieved from the Statistics and Indicator bank Sotkanet (2022), and describes, in euros per capita, the operating net expenditure of primary healthcare on municipal level. The indicator simultaneously accounts for expenditure on oral healthcare in addition to primary healthcare services. Data are reported annually and for the empirical analysis, data are aggregated on regional level (NUTS 3-regions). Primary healthcare services cover basic healthcare services such as in- and outpatient care in health centers, long term care of the elderly, and school healthcare. Specialized healthcare services, such as cancer treatment, are not accounted for in this indicator. The indicator describes net expenditure, *i.e.* health expenditure when all operating costs and operating income are accounted for (Sotkanet.fi Statistics and Indicator Bank, 2022).

Data for the indicator **number of recipients of reimbursements paid out for medical care and medical examinations** ($medicalcare$) are provided by Kela (2022). The indicator shows the number of people who have received reimbursements for private medical care expenses and medical examination costs paid out by Kela. For treatment and medical costs to be reimbursable, they must be of medical necessity to the patient. Furthermore, reimbursements are provided only to those who are covered by the National Health Insurance (NHI) scheme. In general, permanent residents as well as employees and self-employed individuals working for a minimum of four months in Finland are covered by the NHI scheme. Similarly, data for the **number of recipients of reimbursements paid out for dental care and dental examinations** ($dentalcare$) are provided by Kela, under the same conditions as for medical care (Kelasto, 2022).

Population data are obtained through Statistics Finland (2022d, 2022a). Data for **population by nationality and region** ($immig\_share$) and **total population by region** (pop), among other population statistics used in the analysis, are retrieved from the Population structure data set. These data describe the population structure annually and account for permanent residents in Finland. The data are reported at the end of each year. In this thesis, immigration is measured through the number of foreign nationals residing in each region. Consequently, there is a slight error in the estimate compared to the true number of immigrants, as the measure accounts for both immigrants and immigrant descendants who have acquired foreign citizenship based on their parent's nationality. The variables measuring the **share of adults in the immigrant population** ($adults\_share$) and the **share of males in the immigrant population** ($male\_share$) are formed by calculating the share of adults and the share of males within the population of foreign nationals in each region. Lastly, the same population data from the Population structure data set are used to access the indicator **dependency ratio** ($dependency$), that measures the dependency ratio in each NUTS 3-region (Official Statistics of Finland, 2022d).

Following the example of Bettin and Sacchi (2020), control variables that are expected to impact healthcare expenditure are introduced in the empirical model. Hence, data for education levels, female employment rates and GDP per capita are retrieved. The data for **tertiary education levels** ($highered$) are retrieved from the Education structure of the population produced by the Official Statistics of Finland (2022f), which describe the educational structure by region. The variable $highered$ annotates the share of total population with a tertiary degree (level 6 or 7 in the European Qualifications Framework) by region. Education levels are included in the model, as education is an indication of socioeconomic status, which has previously been shown to correlate with health outcomes and healthcare use (Manderbacka et al., 2017).

Statistics on the **female employment rate** ($femployment$) are obtained through Employment statistics produced by Statistics Finland (Official Statistics of Finland, 2022e). The indicator describes the ratio of employed persons to total population within the same age, namely within ages of 18 to 64, by region. Bettin and Sacchi (2020) argue that female employment rates may be used as a proxy measure for informal care provided in the home, often by female relatives, and are thus important to include. In Finland, too, informal care is mainly provided by women (THL, 2022a). Finally, the indicator of **gross domestic product per capita by area** ($GDPpc$) is retrieved from Statistics Finland, Regional Accounts (Official Statistics of Finland, 2022c). The indicator describes the sum of final uses of goods and services by resident institutional units per capita by region. As with education levels, GDP is an indicator of the overall living standard in each region. Furthermore, it may act as a rough measure of the municipalities' abilities to collect taxes for the public healthcare services in each region.

Unfortunately, unlike the control variables of Bettin and Sacchi (2020), the control variables in this study do not include a direct measure on local taxes due to lack of available data. Furthermore, taxes for healthcare are collected at municipal and state level in Finland. As healthcare expenditure is studied on regional level in the thesis, the impact of local taxes would be difficult if not impossible to measure. All data is reported annually for each NUTS 3-region. However, the region of Åland islands is excluded from the analysis due to extensive regional autonomy and differences in the patterns of migration and healthcare expenditure compared to the rest of Finland. A complete list of the variables and their detailed description is presented in table 1 on the next page.

Table 1. Overview of variables.

Variable	Description
$expenditure$	Log of operating net expenditure on primary healthcare, including oral healthcare, in euro per capita.
$medicalcare$	Log of number of recipients for reimbursements provided by Kela for medical expenses.
$dentalcare$	Log of number of recipients for reimbursements provided by Kela for dental care expenses.
$immig\_share$	Number of immigrants divided by total population, per region in %.
$male\_share$	Number of male immigrants divided by total immigrant population, per region in %.
$adult\_share$	Number of adult immigrants (ages 16-64) divided by total immigrant population, per region in %.
pop	Log of total regional population.
$dependency$	Dependency ratio.
$highered$	Share of total population with a tertiary degree.
$femployment$	Female employment rate in %.
$GDPpc$	Log of gross domestic product per capita.

6.2 Descriptive statistics

Next, some descriptive statistics and visual representations of the data are drawn up. The empirical model is then specified, after which some diagnostic tests are performed in order to ensure proper fit of the model. First, summary statistics showing means, standard deviations as well as minimum and maximum values of all the variables that are used in the analysis are presented in table 2. The number of observations for each variable is 180 and data contain information for 18 regions over 10 years in total (2010-2019).

Table 2. Summary statistics of variables.

Variables	Obs.	Mean	Std. Dev.	Min	Max
$expenditure$	180	6.505775	0.1125895	6.199697	6.758791
$medicalcare$	180	10.63608	0.8091807	9.106867	12.95734
$dentalcare$	180	10.54012	0.8147891	8.962008	12.80371
$immig\_share$	180	2.817288	1.467294	1.087323	8.832975
$male\_share$	180	52.08086	2.355583	45.34712	56.02606
$adults\_share$	180	79.71668	2.208365	74.26646	84.66804
pop	180	12.30346	0.70713	11.12958	14.34008
$dependency$	180	149.2383	15.6116	105	178.9
$highered$	180	13.56005	2.790622	9.309262	24.21625
$femployment$	180	0.6932975	0.0319154	0.6316262	0.7750332
$GDPpc$	180	10.43037	0.1494389	10.12604	10.94831

Furthermore, in table 3, a correlation matrix is presented in order to visually inspect correlations in the data. Correlations between individual variables might lead to problems with multicollinearity, which in turn might skew the results by providing imprecise estimates when performing OLS analysis. Possible solutions to problems with multicollinearity include adding more information to the model or, as an alternative, combining or removing certain control variables that are highly correlated and thus causing the problem. If such variables have explanatory power, however, dropping them might instead result in omitted variable bias and as such lead to systematical errors in the estimates. Nevertheless, as multicollinearity might lead to imprecise estimates, it is useful to know whether such problems arise in the model (Greene. W. H., 2018; Wooldridge, 2012).

Table 3. Correlation matrix of pairwise correlations between the variables.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) expenditure	1.00										
(2) medicalcare	-0.62	1.00									
(3) dentalcare	-0.60	0.99	1.00								
(4) immig_share	-0.57	0.63	0.65	1.00							
(5) male_share	-0.47	0.45	0.42	0.35	1.00						
(6) adults_share	-0.00	0.23	0.16	-0.12	0.40	1.00					
(7) pop	-0.55	0.99	0.98	0.58	0.43	0.27	1.00				
(8) dependency	0.51	-0.62	-0.64	-0.62	-0.63	-0.21	-0.62	1.00			
(9) highered	-0.48	0.77	0.74	0.76	0.51	0.19	0.76	-0.59	1.00		
(10)femployment	-0.34	0.29	0.30	0.54	0.65	0.07	0.25	-0.78	0.51	1.00	
(11) GDPpc	-0.45	0.59	0.58	0.83	0.56	0.17	0.56	-0.64	0.82	0.67	1.00

A visual inspection confirms that there is moderate correlation between some of the control variables. The correlation between the variables $GDPpc$ and $highered$ as well as $GDPpc$ and $immig\_share$ stand out as one of the highest, with a coefficient of 0.821 and 0.826 respectively. The highest correlation occurs between the variables $medical\_care$ and pop, and $dental\_care$ and pop with correlations of nearly 1. Although some correlations between variables are moderate to high, multicollinearity is not expected to interfere with the analysis. This is confirmed by performing VIF-tests[11] (*variance inflation factor-test*) in Stata, where all values are close to or slightly below the value 5. As values between 5-10, and particularly values above 10, are considered problematic at times (Wooldridge, 2012), a value close to 5 indicates that multicollinearity is not expected to cause problems in the analysis.

[11] See table 10 under chapter 11.1 in appendix I.

7 Empirical model

In this chapter, the empirical model is developed. First, the basic econometric equation is presented, after which different model specifications and their features are discussed. Furthermore, the assumptions for identification of causal effects are examined. Finally, some diagnostic tests are performed.

The empirical model is designed to test the following hypotheses:

i) Public healthcare expenditure per capita decreases or remains unchanged when immigration increases.

ii) Immigration does not have a significant impact on the number of individuals who are reimbursed for use of private healthcare services.

In order to test the hypotheses, the model is estimated separately three times, with public healthcare expenditure, reimbursements for private medical care, and reimbursements for private dental care, as dependent variables. Analyzing the impact of immigration on these variables separately enables a more complete assessment of the impact of immigration on the healthcare market, as consumers are able to choose between public and private healthcare providers. An analysis focusing solely on the impact of migration on the public sector omits potential effects on the provision of private healthcare services. Although public healthcare expenditure and reimbursements for private healthcare are imperfect measures of the use of healthcare services, they are assumed to provide a sufficient picture of the overall impact on the healthcare market.

First, the basic econometric model is presented. In its simplest form, it takes the following form:

$$expenditure_{i,t} = \alpha + \beta\ immig\_share_{i,t} + \gamma\ pop_{i,t} + \delta\ dependency_{i,t} + \theta\ highered_{i,t} + \sigma\ femployment_{i,t,} + \tau\ GDPpc_{i,t,} + \varepsilon_{i,t} \tag{1}$$

In the equation, the dependent variable $expenditure_{i,t}$ denotes the logarithm of public net expenditure on primary healthcare in euro per capita in region i in a particular year t. The variable $immig_{i,t}$ indicates the share of immigrants in region i in year t and is the main variable of interest in relation to the research question. The variables $pop_{i,t}$, $dependency_{i,t}$, $highered_{i,t}$, $femployment_{i,t,}$ and $GDPpc_{i,t,}$ denote the logarithm of regional population, the dependency ratio, the share of total population with a tertiary degree, the female employment rate and the logarithm of GDP per capita, all for region i and year t respectively. Lastly, the variable $\varepsilon_{i,t}$ represents the error term. Data utilized in the analysis are selected for years 2010-2019.

Analyzing the data with pooled OLS, however, ignores that the data is structured as a panel, with repeated observations of the same entities over time. The model is thus specified further, allowing for region specific effects. Adding region specific effects, captured by variable μ_i, to the basic model yields the following equation:

$$expenditure_{i,t} = \alpha + \beta\ immig\_share_{i,t} + \gamma\ pop_{i,t} + \delta\ dependency_{i,t} + \theta\ highered_{i,t} + \sigma\ femployment_{i,t,} + \tau\ GDPpc_{i,t,} + \mu_i + \varepsilon_{i,t} \tag{2}$$

Depending on assumptions, the region-specific effects in this model can be estimated as random or fixed. According to Wooldridge (Wooldridge, 2010), estimating the model with random effects requires an assumption of zero correlation between the dependent variables and the omitted variables, i.e. the unobserved effects are assumed to be located in the error term and not correlated with the explanatory variables. In a fixed effects estimation, however, this assumption is relaxed. In fixed effects estimation, the unobserved effects are assumed to be correlated with the explanatory variables as it allows for the estimation of partial effects. By utilizing region-fixed effects, region specific and time-invariant factors are controlled for in the model (Wooldridge, 2010). Such factors include prevalence of hearth and vascular disease, of which there is a significantly higher prevalence in the eastern parts of Finland, and distance between patient and medical service providers, which are notably longer in the northernmost regions compared to southern Finland. Further enhancing the model, time specific effects are included by adding the variable ω_t.

The econometric equation, now including time- and region-fixed effects, thus takes the following form:

$$expenditure_{i,t} = \alpha + \beta\, immig\_share_{i,t} + \gamma\, pop_{i,t} + \delta\, dependency_{i,t} + \theta\, highered_{i,t} + \sigma\, femployment_{i,t,} + \tau\, GDPpc_{i,t,} + \mu_i + \omega_t + \varepsilon_{i,t}\,. \quad (3)$$

In addition to eliminating bias caused from time-invariant and region-specific factors, the two-way fixed effects model (2FE) now controls for factors that vary over time but are constant for each region, such as inflation of food prices or government change. Each model specification is estimated with $expenditure_{i,t}$, $medicalcare_{i,t}$ and $dentalcare_{i,t}$ as dependent variables to estimate the total impact of immigration on the healthcare market.

Finally, an instrumental variable similar to that of Bettin and Sacchi (2020) is computed. The instrumental variable exploited by Bettin and Sacchi is a variation of a shift-share instrument widely used in regional economic studies as well as migration studies. Although their efficacy and accuracy has been questioned in recent years (Goldsmith-Pinkham et al., 2020; Jaeger et al., 2018), under certain assumptions IV-estimators provide accurate estimates.

Following the example of Bettin and Sacchi, the shift-share instrument takes the subsequent form:

$$\widehat{immig\_share}_{i,t,} = \left(\sum_j \omega_{i,2000}^{j}\, immig_t^{j,EU15(-FIN)} \right) \Big/ \widehat{pop}_{i,t}, \quad (4)$$

where $\omega_{i,2000}^{j}$ represents the share of immigrants in each region i from origin country j in year 2000, i.e. the variable denotes the regional distribution of immigrants in Finland ten years prior to the time period utilized in the analysis. The second component of the instrument is given by $immig_t^{j,EU15(-FIN)}$, showing the immigrant stock from origin country j for each year t in the EU15 countries, excluding Finland. As such, the variable provides an estimate of the size of the migrant population. Finally, the left-hand side of the equation is divided with the predicted native population in each region i, in each year t as denoted by $\widehat{pop}_{i,t}$. The predicted native population in each region is calculated by allocating the national population in shares according to the distribution of native population in year 2000. All of this considered the instrument $\widehat{immig}_{i,t,}$ shows the predicted share of immigrants in each region i and year t. The IV-regression is estimated using the 2SLS-method and the instrument is deemed strong[12].

As mentioned previously, each model specification presented above is estimated with $expenditure_{i,t}$ as the dependent variable for the original analysis. When examining the crowding out effect, the same models are estimated with $medicalcare_{i,t}$ and $dentalcare_{i,t}$ as dependent variables. Model specification and diagnostic tests are performed for each specification in section 7.1 and 7.3.

[12] See tables 11 and 12 under chapter 11.2 in appendix I for test results.

7.1 Model specification

To ensure proper fit, all model specifications (pooled OLS, random effects, fixed effects, two-way fixed effects), are now tested with model specification tests. The final model, which is utilized in the final analyses, is then chosen based on the test results and econometric theory.

As previously noted, the structure of the panel data implies that pooled regression is a poor estimation method. This is due to the panel consisting of repeated observations of the same entities, instead of several cross-sectional data sets. To exclude the pooled regression model from the analysis, Breusch-Pagan Lagrange multiplier tests (Breusch & Pagan, 1980) are performed in Stata[13]. The null hypothesis of a Breusch-Pagan test is that the random effect variance is equal to zero. Hence, a rejection of the null hypothesis implies that a random effect model is preferable compared to pooled OLS, as it ensures unbiased estimates. Conducting the test in Stata, with each different dependent variable, yields significant results and thus the null hypothesis is rejected in each case[14]. This, in turn, suggests random or fixed effects modeling should be used in the analyses.

Having excluded the pooled regression model, a Hausman specification test is performed in order to compare the RE- and FE-estimators. A key difference between the RE- and FE-estimators is in the assumption of how the unobserved effects behave. In RE-models, it is assumed that the unobserved effect is not correlated with the error term, while FE-models allow for correlation of unobserved effects and the error term (Wooldridge, 2010). The Hausman test assesses this assumption, with the null hypothesis of unsystematic differences in the coefficients, *i.e.* with the null of RE-estimation as the preferred model. The Hausman test is performed separately with each dependent variable. According to Wooldridge (2012) a failure to reject the null hypothesis suggests both FE and RE are feasible, while a rejection indicates

[13] See tables 13-15 under chapter 11.3 in Appendix I for test results.
[14] See tables 16-18 under chapter 11.4 in Appendix I for test results.

that the FE-estimator is preferred. Performing the Hausman test with $expenditure_{i,t}$ as the dependent variable yields insignificant results, thus suggesting that RE be used. For $medicalcare_{i,t}$ and $dentalcare_{i,t}$ the null hypothesis is rejected, suggesting that FE-estimates are preferred. According to Wooldridge (2012), however, failing to reject the null hypothesis suggests that both RE and FE-models are feasible, as only a rejection of the null hypothesis is to be interpreted as conclusive evidence for choosing FE over RE. This is because of the RE assumption of noncorrelation between the unobserved effects and the error term, which is stricter than the FE assumption of potential correlation. Wooldridge further suggests that FE estimates, in general, are superior when working with aggregated data over large geographical units. As this describes the data at hand, FE-estimation is preferred over RE-estimation for all versions of the empirical model.

Next, the exogeneity of the independent variables is examined. For FE-estimates to be unbiased, the explanatory variables must be exogenous*, i.e.* they cannot be correlated with the error term. Endogeneity in the model can systematically skew the regression estimates, so that the effects of individual variables are systematically over- or underestimated. Thus, having computed the instrument, a Wooldridge test of endogeneity (Wooldridge, 1995) is performed to explore whether the main variable of interest, $immig\_share$, is endogenous. The null hypothesis of the test is that the variables are exogenous. Having performed the test after estimating a two-stage least squares (2SLS) regression, for all different dependent variables and exploiting the shift-share instrument presented earlier, the null hypothesis fails to be rejected[15]. Thus, it is assumed that the original regressors are exogenous. The results of the test suggest that it would be erroneous to use instrumental variables in the analysis, as FE-estimates are more precise (Wooldridge, 2012). At this point, estimation of the effects with instrumental variables is thus deemed redundant[16].

[15] See tables 19-21 under chapter 11.5 in Appendix I for test results.
[16] See tables 25-27 in Appendix II for the results of IV-estimation.

Considering econometric theory, the data set at hand, and the specification test results, a two-way fixed effects model is chosen as the estimation method for all of the final analyses. As this thesis examines the effects of immigration regionally by analyzing aggregated data, 2FE estimation is deemed as an appropriate method to utilize. Furthermore, an advantage with 2FE-estimation is that it allows for eliminating factors that vary both over time and are region-specific, and factors that vary over time and are common across regions.

7.2 Identification

As the objective of this thesis is to examine the causal effect of immigration on the healthcare market, namely the impact on public healthcare expenditure and the use of private healthcare, a short discussion on the identification of causal effects is required. In general, the FE-estimator can be utilized to estimate causal effects if the modeling assumptions are satisfied. These assumptions, as presented by Greene and Wooldridge (Greene. W. H., 2018; Wooldridge, 2010, 2012), are examined through diagnostic tests in the next section. However, in this section, the overall assumptions for causal inference with fixed effects estimation are discussed more freely in relation to the hypotheses, theory, and economic reasoning. The assumption of strict exogeneity is of particular concern, but other caveats, such as reverse causality and time-variant heterogeneity (Cunningham, 2021) are also discussed.

First, the assumption of exogeneity is considered. The exogeneity of the explanatory variables is an essential assumption for causal inference, as endogeneity in the model will provide systematically biased estimates. Potential causes of endogeneity include simultaneity bias, omitted variable bias and measurement error in the independent variables (Wooldridge, 2010). Although the Wooldridge tests of endogeneity performed in section 7.1 suggests that there is no simultaneity bias in the models, *i.e.* the estimated residuals are not systematically correlated with the regressors, the FE-estimates retrieved might still be endogenous due to omitted variable bias. If there are other variables that influence healthcare expenditure, which are not included in the model, the true effect of the explanatory variables is systematically over- or underestimated. For instance, migrants tend to cluster in regions with large cities and more population, in other words, in regions where municipalities have more tax revenue available for healthcare expenditure. Furthermore, these regions are often characterized by shorter distances and thus easier access to healthcare services. If these factors are not measured by controls, their effect may falsely be attributed to the variable that measures the share of immigrants. While control variables for population size, GDP per capita, female employment rate, dependency ratio, and education level are included in the model, it is possible that factors, which influence both healthcare expenditure and the share of migrants, are excluded from the model. Nevertheless, the set of controls are in line with those used by Bettin and Sacchi (2020), with tax revenue, excluded from the set of controls due to lack of data, as the only exception. As such, the most obvious and necessary control variables are included in the model.

Time-variant unobserved heterogeneity is a further challenge for causal inference with fixed effects. Although time- and region fixed effects control for both factors that vary over time and are region-specific, and factors that vary over time and are common across regions, the model does not allow for control of time-variant estimates that vary regionally. Such factors could include structural changes in how municipal healthcare is organized in the regions. If healthcare expenditure decreases due to increased efficiency, for instance because of restructuring, the true effect of the regressors might yet again be over- or underestimated. Time-variant heterogeneity might thus cause problems with omitted variable bias. However, this kind of large reforms have not been achieved during the research time period. Moreover, a further caveat for causal inference includes attenuation bias. In this case, attenuation bias is most likely to occur in the variable for immigration, as migrants that reside in the country illegally are not accounted for in the measure. Simultaneously, migrant descendants are included in the measure, thus bloating the estimated number of first-generation immigrants in each region. Nevertheless, as long as this is acknowledged in the interpretation of the results, the measure of the number of immigrants is not considered overly problematic.

Finally, reverse causation is considered. In this case, a reverse causal relationship implies that immigrants will choose their migration destination on the basis of how accessible healthcare is, measured by healthcare expenditure per capita in the empirical model. As established in chapter 3.3, this would be in line with the welfare magnet theory. Unfortunately, this kind of bias is difficult to eliminate, especially as healthcare expenditure per capita and reimbursements for private healthcare act as a proxy for the demand for healthcare. However, previous research from Finland does not suggest that immigrants use healthcare services in a greater extent than the non-migrant population (Castaneda et al., 2015; Nieminen et al., 2014). Hence, it is judged more likely that a causal relationship between healthcare expenditure and migration is produced by the latter variable, although the alternative cannot be fully ruled out.

As previously mentioned, meeting the modeling assumptions is a necessary condition for causal interpretation in fixed effects estimation. In this study, omitted variable bias is deemed as the main concern for causal inference. Nevertheless, with these caveats in mind, the results of the empirical analysis may be interpreted causally.

7.3 Diagnostic testing

Finally, diagnostic tests are performed to confirm that the 2FE-estimation yields unbiased and efficient estimates. All diagnostic tests are performed in Stata and their detailed results are presented in the appendix. The standard assumptions for unbiased and efficient FE-estimation are described as the following by Wooldridge and Greene (Greene. W. H., 2018; Wooldridge, 2010, 2012):

- Linearity, *i.e.* that the dependent and independent variables are linearly associated.
- Full rank, *i.e.* that the regressors are linearly independent and change over time.
- Identical and independently (*i.i.d.)* distributed variables, *i.e.* a random sample.
- Strict exogeneity of independent variables, *i.e.* no independent variable is correlated with the error term.

- Homoscedasticity and nonautocorrelation of the idiosyncratic error, *i.e.* the variance of the error term is consistent for all values for the regressor, and the error term is serially uncorrelated.

The first four conditions (linearity, $i.i.d$, full rank and exogeneity of independent variables) ensure that 2FE-estimation is unbiased, while the final condition of homoscedasticity and nonautocorrelation of the idiosyncratic errors ensures that the 2FE-estimator is efficient. If all of these conditions are fulfilled, a fixed effects-estimator is considered the best linear unbiased estimator available (Greene. W. H., 2018; Wooldridge, 2010, 2012).

First, the assumptions of linearity, $i.i.d.$ and full rank are examined. The panel data set that is utilized in the analysis is balanced and fixed, *i.e.* there are no missing observations in the panel and the same entities are observed over time. Furthermore, the panel is relatively small, observing 16 entities, $i,$ over 10 years, t. A visual inspection of scatter plots with regression lines of the relationship between each of the dependent and independent variables confirms that the linearity condition is met. Although there is some statistical noise in the correlations between the independent variables and $medicalcare$ and $dentalcare$ respectively, a linear relationship describes the correlations best. For $expenditure$, the correlations are clearly linear. This suggests that the first condition is met. However, if the assumption of linearity is false, we expect to see abnormal behavior in the post-estimation residuals. These are examined on the next page and are expected to confirm the linearity assumption.

The second condition of full rank is established to hold true previously, when inspecting data for multicollinearity in chapter 6.2., as VIF-tests confirmed sufficient linear independence. The third assumption of $i.i.d.$ variables is not fully met, as the panel is a time-series that follows the same entities, in this case regions, over time. Thus, it is natural that some variables, such as population size, are autocorrelated over time. However, according to (Wooldridge, 2010), as long as cross-sectional variation is independent, *i.e.* the estimates in one region do not influence the estimates in another region, FE-estimation can be utilized. This is a reasonable assumption, as the provision of municipal healthcare services is limited to its own residents. Thus, public healthcare expenditure in each region is, at least in general, the result of the use of healthcare services by local residents. The fourth assumption, strict exogeneity of independent variables, is shown to be correct in chapter 7.1., where endogeneity tests according to Wooldridge (1999) were performed. Diagnostic testing thus shows that the first four conditions are fulfilled in the data set, *i.e.* that the 2FE-estimator is unbiased.

Finally, homoscedasticity and nonautocorrelation of the idiosyncratic error are examined. A key underlying assumption for FE-estimation is that the idiosyncratic errors ($\varepsilon_{i,t}$) are normally distributed (Wooldridge, 2012), or in other words, that the error term has constant unconditional variance across time and that the errors are serially uncorrelated. After estimating a 2FE model with the different dependent variables, residuals are drawn up for visual inspection[17]. It is concluded that they follow a pattern similar to a normal distribution in each case, confirming homoscedasticity. This is further support for the assumption of linearity, discussed previously. Lastly, serial autocorrelation of the errors is examined. If errors are serially correlated in the data, the estimates yielded through FE-estimation might be imprecise. As autocorrelation is often present when working with panel data, a Wooldridge test for autocorrelation is computed in Stata[18]. The test is performed by utilizing a user-written Stata module by Drukker (2003). The null hypothesis of the Wooldridge test is that there is no first-order autocorrelation in the panel. The hypothesis of no autocorrelation is rejected in each case, suggesting that the errors are serially correlated. Fortunately, autocorrelation does not cause systematic bias, although it might result in less precise estimates. To counter the effects of autocorrelation, cluster-robust standard errors are utilized in the final analyses.

[17] See figures 3-5 under chapter 11.6. in Appendix I.
[18] See tables 22-24 under chapter 11.7 in Appendix I for test results.

8 Results and analysis

In this chapter, the results of the empirical analysis are presented and analyzed. As the analyses are done separately for each dependent variable, $expenditure_{i,t}$, $medicalcare_{i,t}$ and $dentalcare_{i,t}$, the results are grouped under different subsections. Further on, the results are then analyzed with regards to previous research, the theoretical framework, and hypotheses. Finally limitations and critique are discussed, before conclusions are drawn.

8.1 Public healthcare expenditure

First, the results for public healthcare expenditure per capita are presented. In table 4, the preliminary results of the different model specifications discussed in chapter 6 are presented. The regression analysis is performed with the log of operating net expenditure on primary healthcare, including oral healthcare, in euro per capita, as the dependent variable. Measures for R-squared and adjusted R-squared are included for each analysis

Model 1 is estimated as a simple pooled OLS model. According to the model, the share of immigrants in the population has a significant negative impact on operating net expenditure in healthcare. When the share of immigrants increases with one percentage point, healthcare expenditure decreases by -3.9 %. Similarly, the size of the regional population has a negative, albeit minor, effect on healthcare expenditure. As the pooled OLS model does not consider the panel structure of the data, region and time specific effects are introduced in the models 2-5. Model 2 is estimated with region specific random effects. The effect of immigration on healthcare expenditure remains negative, decreasing slightly to a negative impact of -4.7 % on expenditure, when the share of immigrants increases with one percentage point. The results are significant on the 5 %-level. In models 3-5, region and time-specific effects are estimated with fixed effects. Thus, time-fixed effects are introduced in model 3. The effect of immigration remains negative, but drops rather sharply compared to the previous estimates, with a negative impact of -6.3 % when the share of immigrants increases with one percentage point. The results are significant on the

Table 4. Log of operating net expenditure, euro per capita. Different model specifications.

	OLS (1)	RE (2)	FE (3)	FE (4)	2FE (5)
immig_share	-0.0390*	-0.0446**	-0.0631***	-0.0495	-0.0759**
	(0.0204)	(0.0185)	(0.0186)	(0.0287)	(0.0289)
pop	-0.0708*	-0.0326	-0.0772	1.023	-0.452
	(0.0369)	(0.0386)	(0.0636)	(0.899)	(0.840)
dependency	0.000314	0.000709	-0.00654**	0.00386	-0.0124***
	(0.00126)	(0.00140)	(0.00292)	(0.00373)	(0.00296)
highered	0.00828	-0.00865	-0.00992	-0.0313	-0.0415
	(0.0129)	(0.0125)	(0.0239)	(0.0246)	(0.0578)
femployment	-0.00477	-0.00107	-0.0205*	0.0152	-0.0391***
	(0.00735)	(0.00688)	(0.0110)	(0.0188)	(0.00894)
GDPpc	0.126	0.328*	0.222	0.482**	0.0770
	(0.275)	(0.179)	(0.219)	(0.228)	(0.248)
2011.year			0.0551***		0.0895***
			(0.0113)		(0.0213)
2012.year			0.138***		0.212***
			(0.0246)		(0.0505)
2013.year			0.182***		0.294***
			(0.0410)		(0.0844)
2014.year			0.198***		0.345***
			(0.0546)		(0.112)
2015.year			0.167**		0.341**
			(0.0666)		(0.136)
2016.year			0.158**		0.350**
			(0.0745)		(0.162)
2017.year			0.141		0.355*
			(0.0870)		(0.188)
2018.year			0.175*		0.420*
			(0.0997)		(0.218)
2019.year			0.221**		0.492*
			(0.112)		(0.248)
Constant	6.342**	3.698*	7.700***	-12.18	16.30
	(2.749)	(2.116)	(2.714)	(13.31)	(10.89)
Regional effects	No	Yes	No	Yes	Yes
Time effects	No	No	Yes	No	Yes
R^2	0.430	0.393	0.418	0.127	0.566
Adjusted R^2	0.410	-	-	0.097	0.526
Observations	180	180	180	180	180

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1 %-level. Estimating the model with region-fixed effects only (4), however, yields insignificant results.

Finally, a two-way fixed effects model is estimated in model 5. In this model, both time- and region-fixed effects are included. The estimate for $immig\_share$ is increasingly negative, with a reduction by -7.6 % on healthcare expenditure per capita when the share of immigrants increases with one percentage point. The results are significant on the 5 %-level and are in line with those previously presented by Bettin and Sacchi (2020), although the effect in Finnish regions seems significantly larger. Although the estimations for R-squared and adjusted R-squared seem to increase when both time- and region fixed effects are included in the model, the figures should not be interpreted as a signal of better fit, as these are not comparable across different model specifications.

Thus, following econometric theory and initial results, control variables are introduced in the two-way fixed effects model (model 5 in table 4). The results are presented in table 5. First, the variable $male\_share$ representing the share of male immigrants compared to the total immigrant population in percentages, is introduced in model 2. Finally, the variable $adults\_share$ is added in model 3. The variable measures the share of adult immigrants compared to total immigrant population, also in percentages. Controlling for age and gender changes the estimates marginally, reducing the impact to -7.3 % (a reduction of 0.2 percentage points compared to the initial results) when the share of immigrants increases with one percentage point. Neither $male\_share$ nor $adults\_share$ yield significant estimates, suggesting that the demographic composition of the immigrant population, controlled by age and gender, is not the cause of the negative effect. Their insignificance is further supported by the lack of change in the estimations for the adjusted R-squared.

Although not the primary focus of the analysis, it is interesting to note that an increase in the dependency ratio by one percentage point decreases healthcare expenditure per capita by 1.2 %. This is counterintuitive, as it suggests that healthcare expenditure per capita decreases when a larger number of people are outside of the

Table 5. Log of operating net expenditure, euro per capita. Two-way fixed effects model.

	2FE (1)	2FE (2)	2FE (3)
immig_share	-0.0759**	-0.0764**	-0.0726**
	(0.0289)	(0.0282)	(0.0315)
male_share		-0.00117	-0.00227
		(0.00688)	(0.00764)
adults_share			0.00211
			(0.00548)
pop	-0.452	-0.461	-0.520
	(0.840)	(0.847)	(0.888)
dependency	-0.0124***	-0.0125***	-0.0128***
	(0.00296)	(0.00287)	(0.00277)
highered	-0.0415	-0.0429	-0.0450
	(0.0578)	(0.0558)	(0.0547)
femployment	-0.0391***	-0.0398***	-0.0413***
	(0.00894)	(0.00863)	(0.00851)
GDPpc	0.0770	0.0729	0.0766
	(0.248)	(0.253)	(0.244)
2011.year	0.0895***	0.0914***	0.0927***
	(0.0213)	(0.0220)	(0.0220)
2012.year	0.212***	0.215***	0.219***
	(0.0505)	(0.0482)	(0.0473)
2013.year	0.294***	0.298***	0.303***
	(0.0844)	(0.0785)	(0.0770)
2014.year	0.345***	0.351***	0.356***
	(0.112)	(0.105)	(0.104)
2015.year	0.341**	0.348**	0.354**
	(0.136)	(0.128)	(0.125)
2016.year	0.350**	0.358**	0.365**
	(0.162)	(0.152)	(0.150)
2017.year	0.355*	0.365*	0.374**
	(0.188)	(0.177)	(0.173)
2018.year	0.420*	0.431*	0.443**
	(0.218)	(0.207)	(0.202)
2019.year	0.492*	0.505**	0.519**
	(0.248)	(0.235)	(0.229)
Constant	16.30	16.59	17.34
	(10.89)	(11.17)	(11.63)
Regional effects	Yes	Yes	Yes
Time effects	Yes	Yes	Yes
R^2	0.566	0.566	0.567
Adjusted R^2	0.526	0.523	0.523
Observations	180	180	180

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

workforce. Furthermore, the results show a decrease by -3.9 % in healthcare expenditure as the female employment rate increases with one percentage point. This could, in part, be explained by fewer pregnancy- and childbirth related expenses and a move from the public healthcare system to the occupational healthcare services.

8.2 Reimbursements for private medical care

In order to examine a possible crowding out effect, a regression analysis with the logarithm of reimbursements for private healthcare used as the dependent variable is performed. As there are both public and private healthcare providers in Finland, a decrease in public health expenditure per capita does not necessarily imply that that demand for healthcare has not risen in proportion with the population increase caused by immigration. As such, it is important to analyze the use of private healthcare, in addition to public healthcare expenditure.

Five different model specifications, similar to those presented previously in chapter 7.1, are run with $medicalcare$ as the dependent variable. The results are shown below in table 6. In some models, the share of immigrants has a small negative effect, while other models provide a small, albeit positive effect. The results are mainly insignificant across the board. As previously, the final analysis is performed with a two-way fixed effects model (5).

Although the effect of $immig\_share$, the main variable of interest, remains insignificant in model 5, the variables pop and $highered$ are significant on the 1 %-level. As the explanatory variable pop measures the log of total population in each region, the results indicate that a 1 % increase in total population increases the number of recipients for reimbursements for medical care with 2.7 %. This suggests that an increase in population raises the demand for private healthcare services disproportionally. Furthermore, the estimates for $highered$ show a decrease of -9.7 % in recipients of reimbursements when the share of people with a tertiary degree increases with 1 percentage point. The findings are somewhat surprising, as higher education is often positively correlated with income. As private healthcare services are more expensive, and thus more accessible to individuals with a higher income,

Table 6. Log of reimbursements for private medical healthcare. Different model specifications.

	OLS (1)	RE (2)	FE (3)	FE (4)	2FE (5)
immig_share	0.0626*	0.0151	0.00919	-0.0225	-0.0265
	(0.0300)	(0.0229)	(0.0207)	(0.0294)	(0.0235)
pop	1.194***	1.236***	1.246***	2.750***	2.743***
	(0.0618)	(0.0538)	(0.0476)	(0.431)	(0.661)
dependency	0.00543**	0.00617***	-0.00263	0.00991***	-0.000539
	(0.00209)	(0.00180)	(0.00243)	(0.00132)	(0.00213)
highered	-0.0306	-0.0125	-0.0437**	-0.0259**	-0.0974***
	(0.0219)	(0.0112)	(0.0178)	(0.0108)	(0.0281)
femployment	0.0249**	0.00505	-0.00105	0.0212***	0.00501
	(0.0102)	(0.00678)	(0.00936)	(0.00627)	(0.00667)
GDPpc	-0.0119	0.229**	0.0128	0.373***	0.144
	(0.382)	(0.0896)	(0.0985)	(0.0940)	(0.140)
2011.year			0.0349***		0.0521**
			(0.0133)		(0.0194)
2012.year			0.0730***		0.108***
			(0.0193)		(0.0280)
2013.year			0.156***		0.213***
			(0.0365)		(0.0440)
2014.year			0.192***		0.268***
			(0.0527)		(0.0575)
2015.year			0.253***		0.350***
			(0.0653)		(0.0685)
2016.year			0.234***		0.357***
			(0.0725)		(0.0794)
2017.year			0.233***		0.383***
			(0.0725)		(0.0896)
2018.year			0.226***		0.412***
			(0.0791)		(0.110)
2019.year			0.238***		0.450***
			(0.0903)		(0.123)
Constant	-6.228	-8.107***	-3.963**	-29.63***	-23.75**
	(4.428)	(1.838)	(1.648)	(5.972)	(9.146)
Regional effects	No	Yes	No	Yes	Yes
Time effects	No	No	Yes	No	Yes
R^2	0.983	0.975	0.980	0.648	0.757
Adjusted R^2	0.983	-	-	0.635	0.735
Observations	180	180	180	180	180

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

one could expect high tertiary education levels to have a neutral or positive impact on the number of reimbursement receivers. Particularly, as previous research shows that individuals in high-income groups utilize healthcare services in a higher proportion than those in low-income groups (Manderbacka et al., 2017). Although not visible in these results, this disproportionally high use of healthcare services might be discernable in the occupational healthcare system. Unfortunately, due to lack of data, the effect of immigration on the occupational healthcare service systems remains in the dark in this study.

As previously, control variables $male\_share$ and $adults\_share$ are introduced in the 2FE-model (5) and presented separately in a new regression table. The results are presented below, in table 7. Having included the control variables, the effect of the share of immigrants on the number of reimbursements for private medical healthcare remains insignificant. Furthermore, the variables measuring the demographic structure of the immigrant population remain insignificant. As with the previous estimations with $expenditure$ as the independent variable, the lack of change in the measure for the adjusted R-squared suggests that the control variables, which factor in the demographic composition of the immigrant population, do not add explanatory value to the model. All of this suggests that the population share of immigrants does not have an effect on the number of recipients of reimbursements for private healthcare.

Lastly, the estimates for pop and $highered$ change slightly and remain significant when the control variables are introduced. Estimates for $dependency$ and GDP_{PC} remains insignificant.

Table 7. Log of reimbursements for private medical healthcare. Two-way fixed effects model.

	2FE (1)	2FE (2)	2FE (3)
immig_share	-0.0265	-0.0301	-0.0274
	(0.0235)	(0.0229)	(0.0237)
male_share		-0.00800	-0.00881
		(0.00730)	(0.00758)
adults_share			0.00154
			(0.00302)
pop	2.743***	2.682***	2.639***
	(0.661)	(0.563)	(0.559)
dependency	-0.000539	-0.00124	-0.00149
	(0.00213)	(0.00196)	(0.00208)
highered	-0.0974***	-0.107***	-0.108***
	(0.0281)	(0.0313)	(0.0321)
femployment	0.00501	0.000361	-0.000785
	(0.00667)	(0.00825)	(0.00881)
GDPpc	0.144	0.116	0.119
	(0.140)	(0.111)	(0.110)
2011.year	0.0521**	0.0654**	0.0663**
	(0.0194)	(0.0232)	(0.0237)
2012.year	0.108***	0.131***	0.133***
	(0.0280)	(0.0363)	(0.0370)
2013.year	0.213***	0.243***	0.246***
	(0.0440)	(0.0527)	(0.0531)
2014.year	0.268***	0.304***	0.307***
	(0.0575)	(0.0652)	(0.0660)
2015.year	0.350***	0.392***	0.397***
	(0.0685)	(0.0797)	(0.0805)
2016.year	0.357***	0.413***	0.418***
	(0.0794)	(0.0970)	(0.0983)
2017.year	0.383***	0.449***	0.456***
	(0.0896)	(0.117)	(0.119)
2018.year	0.412***	0.491***	0.499***
	(0.110)	(0.146)	(0.149)
2019.year	0.450***	0.537***	0.547***
	(0.123)	(0.164)	(0.168)
Constant	-23.75**	-21.77***	-21.22***
	(9.146)	(6.990)	(7.005)
Regional effects	Yes	Yes	Yes
Time effects	Yes	Yes	Yes
R^2	0.757	0.768	0.769
Adjusted R^2	0.735	0.745	0.746
Observations	180	180	180

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

8.3 Reimbursements for private dental care

Continuing with reimbursements for private healthcare, reimbursements for dental care are now analyzed. As before, results of five different regression outputs are shown in table 8, while the final analysis is performed with a two-way fixed effects model (5), presented in a separate regression table (9). Dental care is analyzed separately, as the access to dental healthcare for adults is limited within the public healthcare system (Mölläri & Martikainen, 2019).

When ignoring the panel data structure and estimating the effect with a simple pooled OLS –model, the estimates show a positive effect of approximately 11.7 % when the share of immigrants increases with one percentage point. When the panel data structure is acknowledged, the effect turns negative. In the two-way fixed effects model, the effect is -7.9 %, i.e. a one percentage-point increase in the share of immigrants reduces the number of recipients of reimbursements for dental care with approximately 8 %. In contrast, the same effect on net operative expenditure per capita, presented in chapter 7.1., amounted to approximately -7.6 %. As with reimbursements for medical care, an increase in population increases the number of recipients of reimbursements for dental care. The effect is roughly the same size, circa 2.8 % when population increases with 1 %. Interestingly, the share of highly educated people has no significant effect on the number of recipients of dental care reimbursements, as compared to medical care reimbursement receivers. As higher education is correlated with more frequent visits to dental caregivers (Nurminen et al., 2021), one would expect a significant positive result. The estimate proves negative but is not significant. Analyzing the results on municipal or ZIP code level, instead of regional, might provide different results as socioeconomic factors could be controlled for more precisely. Unfortunately, such data was not available for this study.

Table 8. Log of reimbursements for private dental healthcare. Different model specifications.

	OLS (1)	RE (2)	FE (3)	FE (4)	2FE (5)
immig_share	0.117***	-0.0185	-0.0185	-0.0778**	-0.0790**
	(0.0387)	(0.0248)	(0.0225)	(0.0298)	(0.0318)
pop	1.181***	1.375***	1.216***	3.157***	2.789**
	(0.0972)	(0.0776)	(0.127)	(0.790)	(1.301)
dependency	0.00263	0.00659***	0.00438	0.0113***	0.00543
	(0.00410)	(0.00242)	(0.00425)	(0.00284)	(0.00407)
highered	-0.0496*	-0.0468***	-0.00896	-0.0583**	-0.0721
	(0.0262)	(0.0120)	(0.0359)	(0.0218)	(0.0707)
femployment	0.0232	0.0156	0.0249	0.0348**	0.0225
	(0.0238)	(0.0122)	(0.0193)	(0.0155)	(0.0213)
GDPpc	-0.326	0.213	0.101	0.354*	0.194
	(0.427)	(0.174)	(0.217)	(0.189)	(0.229)
2011.year			-0.00219		0.0331
			(0.0220)		(0.0262)
2012.year			-0.00531		0.0613
			(0.0395)		(0.0493)
2013.year			0.00799		0.106
			(0.0617)		(0.0825)
2014.year			-0.00674		0.119
			(0.0843)		(0.112)
2015.year			0.00141		0.155
			(0.102)		(0.142)
2016.year			-0.0557		0.136
			(0.114)		(0.167)
2017.year			-0.0871		0.148
			(0.127)		(0.190)
2018.year			-0.138		0.151
			(0.151)		(0.229)
2019.year			-0.147		0.178
			(0.172)		(0.262)
Constant	-2.254	-9.974***	-7.646***	-35.09***	-27.08
	(4.328)	(2.130)	(2.637)	(11.08)	(17.27)
Regional effects	No	Yes	No	Yes	Yes
Time effects	No	No	Yes	No	Yes
R^2	0.971	0.936	0.954	0.569	0.604
Adjusted R^2	0.970	-	-	0.554	0.570
Observations	180	180	180	180	180

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9. Log of reimbursements for private dental healthcare. Two-way fixed effects model.

	2FE (1)	2FE (2)	2FE (3)
immig_share	-0.0790**	-0.0814**	-0.0462*
	(0.0318)	(0.0321)	(0.0235)
male_share		-0.00530	-0.0155**
		(0.00713)	(0.00713)
adults_share			0.0196***
			(0.00600)
pop	2.789**	2.748**	2.200***
	(1.301)	(1.285)	(0.741)
dependency	0.00543	0.00497	0.00177
	(0.00407)	(0.00427)	(0.00287)
highered	-0.0721	-0.0782	-0.0975
	(0.0707)	(0.0710)	(0.0604)
femployment	0.0225	0.0194	0.00482
	(0.0213)	(0.0225)	(0.0145)
GDPpc	0.194	0.176	0.209
	(0.229)	(0.221)	(0.164)
2011.year	0.0331	0.0418	0.0534
	(0.0262)	(0.0326)	(0.0322)
2012.year	0.0613	0.0766	0.107*
	(0.0493)	(0.0599)	(0.0585)
2013.year	0.106	0.126	0.166*
	(0.0825)	(0.0934)	(0.0881)
2014.year	0.119	0.143	0.191
	(0.112)	(0.124)	(0.116)
2015.year	0.155	0.184	0.240
	(0.142)	(0.155)	(0.145)
2016.year	0.136	0.173	0.236
	(0.167)	(0.183)	(0.170)
2017.year	0.148	0.192	0.275
	(0.190)	(0.210)	(0.200)
2018.year	0.151	0.203	0.312
	(0.229)	(0.255)	(0.245)
2019.year	0.178	0.236	0.365
	(0.262)	(0.290)	(0.279)
Constant	-27.08	-25.76	-18.80*
	(17.27)	(17.03)	(9.089)
Regional effects	Yes	Yes	Yes
Time effects	Yes	Yes	Yes
R^2	0.604	0.608	0.690
Adjusted R^2	0.570	0.570	0.658
Regions	18	18	18

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results of the 2FE-regression estimation are presented in table 9. When the control variable for the gender composition of the immigrant population is introduced in the model, the estimate for $immig\_share$ decreases by -0.2 percentage points. The variable $male\_share$, however, remains insignificant. Including both of the control variables $male\_share$ and $adults\_share$ in the model changes the estimates notably.

The effect of a one percentage point increase in the share of immigrants changes from -7.9 % without control variables, to only -4.6 % when both controls are included, while significance is reduced. The estimate for $male\_share$ is now negative and significant (5 %-level). The results show that a one percentage point increase in the share of males among the migrant population corresponds to a -1.6 % reduction in the number of recipients of reimbursements for dental care. The estimate for $adults\_share$, however, is significant on the 1 %-level and shows a positive effect of approximately 2 %. When the share of adults in the immigrant population increases with one percentage point, it corresponds to a 2 % increase in the number of recipients for dental care reimbursements. The positive effect of population increase on the number of reimbursement recipients reduces slightly, from 2.8 % before control variables were introduced to 2.2 % after. Notably, the effects of $adults\_share$ and pop are of roughly the same size.

The change in estimates is accompanied by a change in the measure for the adjusted R-squared. Including the variable $adults\_share$ in the model raises the explanatory power of the model from 57 % to 66 %. This further supports the notion that the age structure of the immigrant population has a true impact on the number of reimbursements for private dental healthcare.

8.4 Discussion

In this section, the key results are summarized and analyzed in more detail. The results are then compared with the hypotheses and discussed in light of previous research and theory. As presented in chapter five, the hypotheses are the following ones:

i) Public healthcare expenditure per capita decreases or remains unchanged when immigration increases.

ii) Immigration does not have a significant impact on the number of people who are reimbursed for the use of private healthcare services.

The first hypothesis is related to the theories on the migration decision, while the second hypothesis relates to the organization of the healthcare market and consumer choice in mixed markets. Having completed the empirical analyses, the first hypothesis is confirmed. The findings indicate that immigration has a substantial negative impact on public healthcare expenditure, *i.e.* increases in immigration cause decreases in per capita healthcare expenditure in the public sector. As the findings indicate that there are no significant effects of immigration on the reimbursements for use of private medical care, with reimbursements for dental care as the exception, it is judged that there is little to no support for the crowding out-hypothesis. Now, the results are further analyzed and potential causes for the results are examined.

Regarding public healthcare, a one percentage point increase in the share of immigrants is estimated to cause a -7.3 % reduction in per capita public healthcare expenditure. In other words, when the population grows due to immigration, per capita expenditure decreases disproportionally. The result remains significant when controlling for gender and age composition of the immigrant population. Returning to theory, the results are in line with the initial health selection model of migration by Jasso and Massey (2004), which suggests that immigrants are healthier than the general population, as migration in itself requires a sufficient initial health level. In their framework, Jasso and Massey propose that the level of self-selection among immigrants is influenced by the cost of migration (*e.g.* physical distance), skill transferability (*e.g.* approval of previous qualifications in the labor market) and skill price relations (wages in the destination country compared to wages in the origin country). Furthermore, they suggest that quality of healthcare might cause the marginal migrant to be less healthy. In effect, when costs increase and skills are not as easily transferred to the destination country, migrants will be more strongly selected on health. Equally, the higher the wages are, and the better the quality of healthcare is, the weaker the self-selection on health is.

Naturally, these factors will vary for individual migrants depending on their initial home country and individual skills. However, the shape of Finnish society and economy might provide some clues with regards to the importance of health for migrants headed for Finland. Obviously, this is an oversimplified description of Finnish society, but nonetheless, it might provide theoretical insight into the importance of health levels among migrants headed to Finland. First, located in the periphery in the northern hemisphere, one can assume that the cost of moving to Finland is in itself relatively high, requiring larger initial health levels. As a Nordic welfare state, however, the quality of and access to healthcare services is good. This, in turn, reduces the importance of good initial health among migrants. Furthermore, as a high-income country, wages are assumed to be higher than in most migrant origin countries, similarly reducing the necessity of good initial health. Skill transferability is presumably low, as the Finnish labor market is notoriously difficult for immigrants to access and migrants are often socioeconomically disadvantaged (Eronen et al., 2014), increasing the importance of initial health levels. Although not measurable in this study, overall, several factors imply that the self-selection mechanism on health among immigrants headed to Finland is relatively weak. Still, the initial health selection model of migration presented by Jasso and Massey (2004) provides a better theoretical explanation of the impact on healthcare expenditure compared to the welfare magnet theory (Borjas, 1999), which implies that the Finnish welfare benefits and the universal healthcare system will attract migrants that are less healthy, and in need of more healthcare services. Such an effect is not visible in the data, and thus it is deemed unlikely that migration patterns to Finland are explained by the welfare magnet theory.

Unfortunately, however, the underlying mechanism behind the decrease in health expenditure cannot be confirmed with the data and research methods of this thesis. Still, comparing the results with theory and previous research alludes to some explanations that should be further explored in the future. In addition to the healthy immigrant effect, other factors such as socioeconomic status among immigrants and access barriers to healthcare should be examined. All of these could contribute to a lower demand for healthcare services among the immigrant population compared to the non-immigrant population. For instance, previous research from Finland suggests that the health levels of immigrants are, in general, better than those of the general population (Nieminen et al., 2014), implying an existence of the healthy immigrant effect. Still, it is more likely that the negative impact on healthcare expenditure is, in a larger part, explained by socioeconomic status and access barriers to healthcare (Greve, 2016), as the healthy immigrant effect has been shown to fade with time (Bedard & Antecol, 2006; Chiswick et al., 2008; Gotsens et al., 2015; Ng, 2011; Vang et al., 2017). In fact, previous research has established a positive correlation between income and the use of healthcare services, *i.e.* individuals from low-income groups, in which immigrants are overrepresented (Ruotsalainen, 2015), tend to use less healthcare services than individuals that are socioeconomically advantaged (Manderbacka et al., 2017). Finally, there are indications of access barriers in the healthcare system, which might limit the use of healthcare services among immigrants (Alitolppa-Niitamo et al., 2013; Koskimies & Mutikainen, 2008). Still, the extent to which these different factors impact the size of the negative effect remains unidentified.

Finally, the results are compared with the study of Bettin and Sacchi (2020), as the methodologies and empirical strategies are similar. As expected, the results are in line with those obtained by Bettin and Sacchi (2020), who find that a one percentage point increase in the share of immigrants leads to a -3.8 % reduction in healthcare expenditure with, at least somewhat, similar methodology. The effect found in this study, however, is significantly larger at nearly double the size. One possible explanation is that the access barriers to healthcare services in Finland are larger compared to those in Italy. Furthermore, drawing from the theory on self-selection, there may be differences in the initial health levels among those who arrive in Italy and those who arrive in Finland. The idea that self-selection increases with distance has been proposed previously, both theoretically and empirically (Chiswick, 1999; Farré, 2016; Jasso & Massey, 2004). It is thus possible, that the immigrants who are able to migrate all the way to Finland, a country in the global periphery, are comparatively healthier than those arriving in Italy, a country closer to central Europe and the migrant routes from Asia and Africa.

Having analyzed the first hypothesis, the second hypothesis is now discussed in more detail. As expected, immigration does not have a significant impact on the number of people who are reimbursed for the use of private medical services. As such, the results of the regression analysis do not support the idea of a crowding out effect regarding medical care and medical examinations. Regarding dental care, however, the results are different. When age and gender in the immigrant population are controlled for, a one percentage point increase in the share of immigrants, compared to total population, decreases the recipients of reimbursements for private dental care with -4.6 %. However, when the share of adults in the immigrant population increases with one percentage point, the number of reimbursement recipients increases with approximately 2 %. In contrast, an increase in the share of males in the immigrant population has a small, negative effect on the number of reimbursement recipients. Thus, contrary to the results regarding medical care, the estimates suggest that the age composition of the immigrant population has an impact on the number of reimbursements for private dental healthcare. In order to understand the results, the dental healthcare market is examined through the duplicative healthcare services framework provided by Barros and Siciliani (2011).

In a mixed healthcare market with duplicative services, a consumer chooses healthcare provider based on amenities, waiting times, quality of care and prices in the public and private sector (Barros & Siciliani, 2011). Of these, waiting times and prices are assumed to be most important for the consumer. In effect, a consumer chooses between paying less and waiting longer in the public sector or paying more in order to skip the queue in the private sector[19]. Examining the dental healthcare market in Finland, shows that the dental healthcare services provided in the public sector are strained. For adults, waiting times in the public sector are, at times, considerable (Keskimäki et al., 2019; Mölläri & Martikainen, 2019), suggesting that the public sectors' capacity to offer dental healthcare services and react to changes in demand is limited. Thus it is possible that even a small increase in demand for public dental healthcare results in a crowding out effect, *i.e.* even the slightest increase in demand increases waiting times substantially, consequently pushing more individuals, who prefer paying for private healthcare services instead of waiting a longer time for public dental care, to opt out from the queue. As the number of reimbursements for private dental care increased when the share of adults in the migrant population increased, it is likely that the organization of adult dental healthcare in Finland is a part of the explanation.

Overall, the negative impact on public healthcare expenditure and the insignificant results for reimbursements for medical care indicate that the use of healthcare among immigrants is lower than among the general population. The results are thus in line with previous international and Finnish studies, which show that healthcare use among immigrants is similar or slightly lower than among the general population (Castaneda et al., 2015; Malin et al., 2006; Nieminen et al., 2014; Sarría-Santamera et al., 2016), that immigration has a negative impact on healthcare expenditure (Bettin & Sacchi, 2020) and that immigration in some instances has reduced waiting times for outpatient referrals (Giuntella et al., 2018). In contrast, the results differ with research from Denmark and Spain (Carrasco-Garrido et al., 2007; Nielsen et al., 2012), which find that the use of healthcare services among immigrants is slightly higher than among the native population. However, this contrast may, in part, be explained by differences in the healthcare system design. Further comparative research in the area is needed, however, to determine whether this is the case.

[19] For dental healthcare services, this is particularly true as employers are not required to offer dental healthcare through the occupational healthcare system.

In summary, the results show support for both of the hypotheses. While the results are in line with the predictions of the initial health selection model of migration, it is impossible to confirm if the results are, in fact, caused by self-selection among immigrants. Furthermore, it is possible that other factors, which are not included in the empirical model, confound the results. Hence, the next subchapter is focused on critique and limitations of the study.

8.5 Limitations and future research

Ideally, establishing a full picture of the impact of immigration on the healthcare market would require a broader analysis that accounts for both supply- and demand-side effects of migration. For instance, as mentioned in the introduction of the thesis, immigration indirectly impacts the funding of the public healthcare system by its influence on the population structure and the working-age population. As public and private sector interact in the healthcare sector, the funding and resources of the public healthcare providers set the boundaries for services provided by private actors. None of these "supply-side" effects are accounted for in the study, as such an analysis is far too extensive to include within the scope of the thesis. Instead, the analysis is focused on how immigration impacts demand for healthcare services. A complete analysis would include an examination of all three healthcare service channels that exist in the country. Unfortunately, only the public and private healthcare service channels are considered in the study due to lack of data from the occupational healthcare service. As such, the effect of immigration on the occupational healthcare service is not examined, and, accordingly, the full effect of immigration on the demand-side of the healthcare system remains unknown. However, as access to occupational healthcare is limited by employment, and the scope of services in occupational healthcare is restricted, it is reasonable to assume that an analysis of the other two service channels is, at least, indicative of the overall effect of immigration on the demand-side of the healthcare system.

Furthermore, when working with data on population level, as in this study, the results should be interpreted with caution. For instance, it is not possible to control for socioeconomic status or health levels in the model. Hence, the study fails to establish the underlying causes of the negative effect on healthcare expenditure. Potential mechanisms include the healthy immigrant effect, low socioeconomic status among immigrants, or access barriers in the healthcare system, yet the true cause of the effect will remain unknown due to the design of the study. Moreover, simply analyzing healthcare expenditure does not allow for conclusions to be drawn regarding healthiness or the need for healthcare services among immigrants. Although it is known that migrants tend to be socioeconomically disadvantaged (Eronen et al., 2014; Ruotsalainen, 2015) the difficulty lies in examining how this impacts the need for and the use of healthcare services among immigrants. For instance, while immigrants are socioeconomically disadvantaged, previous research shows that their use of healthcare services is at a similar level or lower than among the general population (Castaneda et al., 2015; Malin et al., 2006; Nieminen et al., 2014). As socioeconomic disadvantage is linked to poorer health in Finland (Keskimäki et al., 2019), this, on the one hand, could indicate that immigrants have a health advantage that counters the socioeconomic disadvantage of lower disposable income, resulting in a smaller demand for healthcare than among the general population with similar socioeconomic status. On the other hand, however, it might indicate that there is underutilization of healthcare services among migrants, perhaps due to access barriers, that explain the decrease in per capita healthcare expenditure. Unfortunately, due to the methodology of the study, the mechanism behind the negative effect on healthcare expenditure remains unidentified.

A failure to identify the underlying mechanism behind the results further suggests that the results should not be exploited to predict the long-term healthcare impact of migration. For instance, if the reduced per capita expenditure is caused by systematic underutilization of healthcare services among immigrants, untreated illnesses and undiagnosed conditions may result in significant increases in healthcare expenditure later on, as pre-emptive care and early diagnoses could have been cheaper than treating chronic conditions. Moreover, the study does not allow for an analysis by migrant category. While it is expected that the welfare impact of immigrants differs depending on the composition of the migrant population, *i.e.* whether the immigrant population mainly consists of economic migrants or of refugees, the study fails to recognize the impact of each migrant group separately. Thus, while the study shines light on the relationship of migration and healthcare during the research period, studies which analyze the impact by migrant category are needed for predictions of the long-term impact of immigration. Furthermore, due to the design of the empirical study, it fails to distinguish which theory best describes the healthcare impact of immigration in Finland. Future studies that wish to examine or prove these theories are advised to utilize similar frameworks as Chiswick et al (2008) and Farré (2016), which consider the selection mechanism and analyze different migrant groups separately.

Moreover, as discussed in chapter 7.2., there are some caveats for interpreting the results causally. For instance, the sudden increase in the number of asylum seekers during the year 2015 might slightly bias the results as the healthcare of asylum seekers is organized separately from the municipal healthcare scheme, while they are still included in the measure of immigrants. Moreover, failing to control for socioeconomic status among the population is considered to be a likely cause of omitted variable bias in the study. Finally, it is worth noting that the analysis is done on a regional level, while public healthcare is organized municipally. Consequently some heterogeneity, caused by factors that vary between municipalities, is not visible in the data, and careful judgement of the estimates is required. Nevertheless, the estimates are considered to reveal a causal link between the level of migration and healthcare expenditure during the research period.

Having presented the limitations of the study and discussed ideas for future research, finally, the conclusions are drawn in the last chapter of thesis.

9 Conclusions

The purpose of this thesis is to analyze the welfare impact of immigration, by examining the effect of immigration on the healthcare market in Finland during the years 2010-2019. The thesis adds to a growing literature on immigration and healthcare, while providing new insight into the impact of immigration on public healthcare expenditure and on the number of reimbursements for private health- and dental care in the Finnish healthcare market.

The empirical analysis shows, in line with the first hypothesis, that an increase in the share of immigrants in the Finnish population had a negative impact on public healthcare expenditure per capita during the years 2010-2019. Following the prediction of the second hypothesis, the results suggest that immigration did not cause longer waiting times in the public healthcare system, which in turn would have caused some consumers to shift their use of healthcare services from public to private providers. The results show that the share of immigrants had no impact on the number of individuals who were reimbursed for use of private medical care services. In contrast, however, the number of individuals who were reimbursed for the use of private dental care services increased slightly when the share of adults in the immigration population increased. As this increase was of equal size to the effect of an overall population increase, however, it suggests that the effect is, at least in part, caused by how adult dental healthcare is organized in Finland. In conclusion, there is little to no evidence for a crowding out-effect in the healthcare market due to immigration during the research period.

Due to the research design, the results can neither confirm nor reject support for the welfare magnet theory or the theory of initial self-selection on health. As such, the underlying cause behind the results remains unknown. This, in turn, makes it difficult to predict the long-term impact of immigration on the healthcare market based on these results. If the negative impact of immigration on healthcare expenditure per capita is caused by access barriers, which limit access to healthcare for those who need it, instead of a healthy immigrant effect, it may lead to increased financial and human costs in the long-term. Hence, more research into the mechanisms behind the outcomes is required.

In a heated public debate on immigration, which is often scattered with widespread beliefs and misinformation of its causes and effects, it is imperative that more research on the actual effect of immigration is carried out, and the results of these studies communicated to the public. This thesis adds to the increasing empirical literature on those effects. Albeit failing to identify the underlying causes for the negative impact on healthcare expenditure, the thesis provides an important glimpse into the welfare impact of immigration in the Finnish healthcare sector. In addition to examining the economic impact of immigration in receiving countries, future research should place emphasis on understanding the broader impact of migration on societies, both in destination and origin countries.

Summary in Swedish - Svenskspråkig sammanfattning

Migration och hälsovård: en inblick i offentliga hälsovårdsutgifter och ersättningar för privat vård i finländska landskap åren 2010–2019

Till skillnad från övriga nordiska länder förblev Finland ett relativt homogent samhälle med låg invandring ända till 1990-talet (Østby & Aalandslid, 2020). De senaste trettio åren har dock immigrationen till Finland ökat (Statistikcentralen, 2022b) och förändringen har fört med sig en allmän, ibland hetsig, debatt om invandringens samhälleliga effekter. Ofta är diskussionen präglad av åsikter grundade på förutfattade meningar till skillnad från rena fakta. I ett sådant diskussionsklimat är behovet av empirisk forskning kring effekterna stort.

I den här pro gradu-avhandlingen undersöks migrationens välfärdseffekter genom dess påverkan på hälsovårdsmarknaden i Finland. Avhandlingens fokus ligger på att undersöka hur immigration påverkar efterfrågan på hälsovårdstjänster på den finländska hälsovårdsmarknaden, där både privata och offentliga aktörer erbjuder hälsovårdstjänster. Hälsovården är av särskilt intresse, eftersom utgifterna för social- och hälsovård utgör en av de största utgiftsposterna i den offentliga budgeten och kostnaderna förväntas att öka i takt med att den finländska befolkningen åldras (Aalto et al., 2020). Immigrationens effekter på efterfrågan av hälsovårdstjänster undersöks genom att analysera utvecklingen av nettoutgifter per capita för den offentliga hälsovården samt antalet ersättningar för privat hälso- och tandvård som utbetalats av Folkpensionsanstalten (FPA). Eftersom de tjänster som erbjuds genom arbetshälsovården är begränsade i både omfång och tillgång, är dessa uteslutna ur analysen. I avhandlingen analyseras effekterna landskapsvis för åren 2010–2019.

Den teoretiska referensramen i avhandlingen utgår från ett mikroekonomiskt perspektiv och behandlar individers migrations- och konsumtionsbeslut. De teorier gällande migrationsbeslutet som presenteras i avhandlingen bygger på anpassningar av den klassiska humankapitalteorin om arbetskraftsmigration, vars grundidé är att en individ väljer att migrera då nyttan överstiger kostnaden för att göra det. Den klassiska modellen med förväntad inkomst för en individ som överväger ett migrationsbeslut kan sedan anpassas för att beakta andra faktorer, såsom välfärdstjänster

i form av avgiftsfri hälsovård, eller individens ursprungliga hälsonivå (Bodvarsson et al., 2015).

Den första, teorin om hälsoselektion (Jasso & Massey, 2004), har som uppgift att förklara ”the healthy immigrant effect”-fenomenet (HIE), som beskriver den hälsofördel som observerats bland migranter i tidigare studier. Enligt teorin om hälsoselektion kännetecknas emigration av ett positivt urval, vilket medför att migranter har en bättre grundhälsa än den övriga befolkningen. Det här beror på att en god hälsa möjliggör en högre arbetstakt och således är det möjligt för migranten att förvärva en större inkomst i destinationslandet. Den högre intjäningsförmågan gör det mera lönsamt för individer med en god hälsa att migrera jämfört med individer med sämre hälsa. Övriga faktorer, såsom skillnader i lön mellan ursprungs- och destinationsland och själva kostnaden för att migrera påverkar även migrationsbeslutet. Då löneskillnaderna är små och kostnaden för att migrera hög är urvalseffekten större (Jasso & Massey, 2004). Eftersom teorin om hälsoselektion hävdar att migranter har en bättre hälsa medför den även att dessa har en lägre efterfrågan på hälso- och sjukvård. En annan slutsats går att dra utgående från välfärdsmagnetteorin (Borjas, 1999). Välfärdsmagnetteorin, som inte i sig är kopplad till hälsa, utgår även den från tanken om inkomstmaximering vid ett migrationsbeslut. Enligt modellen kommer migranter med lägre humankapital att välja ett sådant destinationsland där det sociala trygghetsnätet är bättre, eftersom det möjliggör en högre inkomst i fall av arbetslöshet. I och med att tidigare empirisk forskning visar att det finns en koppling mellan humankapital och hälsa (Cutler & Lleras-Muney, 2006), implicerar teorin således att efterfrågan på hälsovård är högre bland dessa migranter.

Tidigare empirisk forskning stöder inte entydigt någondera av teorierna. Empiriska resultat från europeiska studier har exempelvis uppvisat blandat stöd för HIE-fenomenet (Farré, 2016; Greve, 2016; Ichou & Wallace, 2019; Moullan & Jusot, 2014; Nolan, 2012). Emellertid finns det flera studier som visar att immigranters hälsonivå är kopplad till destinationslandets immigrationspolicy (Chiswick et al., 2008; Constant et al., 2018). Exempelvis visar en studie från Australien att immigranters självrapporterade hälsonivå varierar beroende på vilken visumkategori de tilldelats vid invandring (Chiswick et al., 2008) och en jämförande studie av immigranter till

Israel och vissa europeiska länder visar liknande samband mellan immigranternas hälsonivåer och ländernas riktlinjer för immigration (Constant et al., 2018). För humanitära migranter är hälsonivåerna i regel sämre (Chiswick et al., 2008; Mölsä et al., 2014). Eftersom majoriteten av de som migrerar till Finland gör det av arbets- eller familjerelaterade orsaker (Migri, 2020; Sutela & Larja, 2014) finns det inga skäl att utgå från att immigranter i genomsnitt har sämre hälsa än den övriga befolkningen. Således kan det antas att invandring inte har en oproportionerligt stor ökning på efterfrågan av hälsovårdstjänster. Följaktligen är den första hypotesen att *de offentliga hälsovårdsutgifterna kommer att minska eller hållas på samma nivå då invandringen ökar*.

Eftersom tjänster på den finländska hälsovårdsmarknaden erbjuds av både offentliga och privata tjänsteleverantörer, förutsätter en fullkomlig analys av immigrationens effekter emellertid även en undersökning av användningen av den privata hälsovården. Analysen utgår från teorin om konsumtionsbeslut i en blandad hälsovårdsmarknad (Barros & Siciliani, 2011), dvs. en marknad med både privata och offentliga aktörer. Enligt teorin väljer en individ tjänsteleverantör för hälsovård på basis av kostnad, bekvämlighet, inkomst och väntetid inom den privata och den offentliga vården. I regel är priset för den privata vården högre, medan väntetiden är kortare och bekvämligheterna bättre. Eftersom den offentliga sektorn varken kan påverka pris eller bekvämligheter på kort sikt, blir väntetiden ett icke-monetärt pris som styr individens konsumtionsbeslut i valet mellan offentlig och privat vård (Barros & Siciliani, 2011; Hoel & Sæther, 2003). Ju längre väntetiderna är i den offentliga vården, desto fler individer finns det som är villiga att betala ett högre pris för privat vård för att slippa vänta. Utöver en analys av per capita nettoutgifter för den offentliga vården undersöks således även ersättningar för privata hälsovårdstjänster för att utesluta att en sådan crowding out-effekt uppstår. Den andra hypotesen är att *immigration inte har en signifikant effekt på antalet individer som utbetalas ersättningar för privat vård från FPA*.

I den empiriska regressionsanalysen utnyttjas både tids- och landskapsfixa effekter för att estimera en kausal effekt (2FE-modell). Variablerna och analysmetoden är lika de som används i en studie av Bettin och Sacchi (2020), i vilken effekten av invandring på hälsovårdsutgifter i Italien undersöks. Data för variablerna är hämtade från statistik- och indikatorbanken Sotkanet, databanken Kelasto samt Statistikcentralen. De oberoende variablerna beskriver nettoutgifterna per capita för offentlig hälsovård, antalet mottagare av FPA-ersättningar för privat hälso- och tandvård, andelen invandrare i förhållande till den totala befolkningen, andelen män i förhållande till alla invandrare, andelen vuxna i förhållande till alla invandrare. Kontrollvariablerna mäter befolkningsstorlek, försörjningskvot, andelen högt utbildade, kvinnors sysselsättningsgrad samt BNP per capita i varje landskap.

Resultaten visar att de offentliga utgifterna per capita sjunker då andelen immigranter i förhållande till den totala populationen ökar (tabell 5). Det här är i linje med den första hypotesen om att de offentliga hälsovårdsutgifterna kommer att minska eller hållas på samma nivå då invandringen ökar. Vidare visar resultaten att andelen immigranter inte har någon signifikant effekt på FPA-ersättningar för privat hälsovård (tabell 7). Resultaten för FPA-ersättningar för tandvård är mindre entydiga, eftersom de visar att andelen vuxna bland immigranterna har en positiv effekt på antalet individer som erhållit FPA-ersättningar (tabell 9). Effekten är emellertid i samma storlek som effekten av en ökning av befolkningsmängden. Den positiva effekten på antalet individer som erhållit FPA-ersättningar för tandvård kan, åtminstone till en del, bero på hur den offentliga tandvården är arrangerad i Finland. Det finns indikationer på att den offentliga tandvården för vuxna redan är ansträngd (Mölläri & Martikainen, 2019) och att detta bidrar till att en crowding out-effekt uppstår då befolkningsmängden ökar – vare sig det handlar om inflyttning eller befolkningstillväxt av andra orsaker.

Resultaten är i linje med tidigare forskning om invandrares användning av hälsovårdstjänster i Finland (Castaneda et al., 2015; Malin et al., 2006; Nieminen et al., 2014). Utgående från analysen kan dock varken hälsoselektionsteorin bekräftas eller välfärdsmagnetteorin förkastas, även om hälsoselektionsteorin förklarar resultaten bättre. Det här beror på att andra faktorer än god hälsa bland immigranter inte kan uteslutas ur analysen på grund av datamaterialet och metodvalet. Andra möjliga förklaringar till den negativa effekten innefattar barriärer för tillgång till hälsovård, såsom brist på information eller språkkunskaper, samt socioekonomisk status bland immigranter. Tidigare forskning från Finland visar t.ex. att individer med lägre socioekonomisk status, en grupp som immigranter är överrepresenterad i, använder hälsovårdstjänster i en lägre grad än individer med högre socioekonomisk status (Manderbacka et al., 2017) trots att behovet av tjänsterna kan vara högre. Vidare forskning, ur olika perspektiv och med olika metoder, behövs för att fastställa de bakomliggande orsakerna till den negativa effekten av immigration på offentliga hälsovårdsutgifter.

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Appendix I

In this section, the results of the diagnostic tests performed in chapter six and seven of the thesis are shortly described and presented. All tests are performed in Stata using built-in or user-written commands.

Variance Inflation Factor test

Variance Inflation Factor tests (VIF-tests) are utilized to detect multicollinearity among independent variables in a regression model. According to Wooldridge (2012), values under 5 indicate that there is slight multicollinearity present in the model, values of 5-10 indicate moderate issues with multicollinearity and values over 10 are considered particularly problematic. As the VIF-test result mean value is fairly close to five in the model, multicollinearity is not expected to cause serious problems for the analysis.

Table 10. Variance inflation factor test.

Variable	**VIF**	**1/VIF**
$highered\_share$	5.93	0.168616
$dependency$	5.83	0.171491
$GDPpc$	5.56	0.179724
$femployment$	5.23	0.191182
pop	4.90	0.203977
$immig\_share$	3.62	0.275863
Mean VIF	5.18	

Testing of weak instruments

As weak instruments in an IV-regression might cause biased estimates, it is necessary to tests the "strength" of the instrumental variables. The tests are performed in Stata utilizing the integrated ivregression postestimation tool. By typing the command "*estat firststage*", two different weak instrument tests are performed. The weak instruments tests examine the instrument through the null hypothesis of weak instruments. A significant test result thus suggests that the null be rejected, and that the instrument is suitable. Performing the weak instrument test after a two-stage least squares regression shows that the instrument is strong. Both test results presented below show, that the null of weak instruments is rejected (Anderson, 2021).

Table 11. Weak instruments testing. First-stage regression summary statistics.

H0: Instruments are weak, variable *immig_share*
R-squared = 0.8030
Adjusted R-squared = 0.7962
Partial R-squared = 0.859
Robust F (1,173) = 69.0182
Prob > F = 0.0000

Table 12. Weak instrument testing. Minimum eigenvalue statistic.

H0: Instruments are weak				
Minimum eigenvalue statistic = 69.253				
	5 %	10 %	20 %	30 %
2SLS size of nominal 5% Wald test	16.38	8.96	6.66	5.53
LIML size of nominal 5% Wald test	16.38	8.96	6.66	5.53

Breusch-Pagan Lagrange Multiplier test

The Breusch-Pagan Lagrange multiplier test (Breusch & Pagan, 1980) is utilized in model specification, to assess whether the variance in the residuals is homoscedastic. The null hypothesis of the test is that random effect variance is equal to zero, *i.e.* a pooled regression model is preferable. A rejection of the null hypothesis, in turn, implies that there is heteroscedasticity in the residuals and RE/FE-estimation is preferred, as it ensures unbiased estimates. Conducting the test in Stata, with each different dependent variable, yields significant results and thus the null hypothesis is rejected in each case. This, in turn, suggests random or fixed effects modeling should be used in the analyses.

Table 13. Breusch and Pagan Lagrangian multiplier test for random effects with *expenditure* as the dependent variable.

Dependent variable: *expenditure*
H0: Var (u) = 0
chibar2(01) = 256.84
Prob > chibar2 = 0.0000

Table 14. Breusch and Pagan Lagrangian multiplier test for random effects with *medicalcare* as the dependent variable.

Dependent variable: *medicalcare*
H0: Var (u) = 0
chibar2(01) = 554.90
Prob > chibar2 = 0.0000

Table 15. Breusch and Pagan Lagrangian multiplier test for random effects with *dentalcare* as the dependent variable.

Dependent variable: *dentalcare*
H0: Var (u) = 0
chibar2(01) = 494.93
Prob > chibar2 = 0.0000

Hausman specification test

A Hausman specification test is used for comparing RE- and FE-estimators. The null hypothesis of the test is that there are unsystematic differences in the coefficients, *i.e.* RE-estimation is the preferred model. A rejection of the null hypothesis suggests that FE-estimation is more consistent. If the test fails to reject, the decision between RE- and FE-estimations should be based on other factors, such as evaluation of economic theory and the research setting (Wooldridge, 2010).

Table 16. Hausman specification test for fixed or random effects with *expenditure* as the dependent variable.

Dependent variable: *expenditure*

H0: the difference in coefficients is not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 10.50

Prob>chi2 = 0.1050

Table 17. Hausman specification test for fixed or random effects with *medicalcare* as the dependent variable**.**

Dependent variable: *medicalcare*

H0: the difference in coefficients is not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 18.27

Prob>chi2 = 0.0056

Table 18. Hausman specification test for fixed or random effects with *dentalcare* as the dependent variable

Dependent variable: *dentalcare*
H0: the difference in coefficients is not systematic
chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 69.94
Prob>chi2 = 0.0000

Wooldridge test of endogeneity

A Wooldridge test of endogeneity investigates whether variables that are assumed to be endogenous are, in fact, exogenous. The null hypothesis of the test is that the variables are exogenous. A significant test statistic thus indicates that the variables must be treated as endogenous. Equally, a failure to reject the null suggests that the variables can be treated as exogenous (Wooldridge, 1995).

Table 19. Wooldridge test of endogeneity with *expenditure* as the dependent variable.

H0: variables are exogenous	
Dependent variable: *expenditure*	
Robust regression F(1,17)	= 0.015416 (p = 0.9026)

Table 20. Wooldridge test of endogeneity with *medicalcare* as the dependent variable.

H0: variables are exogenous	
Dependent variable: *medicalcare*	
Robust regression F(1,17)	= 0.077515 (p = 0.7841)

Table 21. Wooldridge test of endogeneity with *dentalcare* as the dependent variable.

H0: variables are exogenous		
Dependent variable: *dentalcare*		
Robust regression F(1,17)	= 1.063	(p = 0.3170)

Visual inspection, normality of residuals

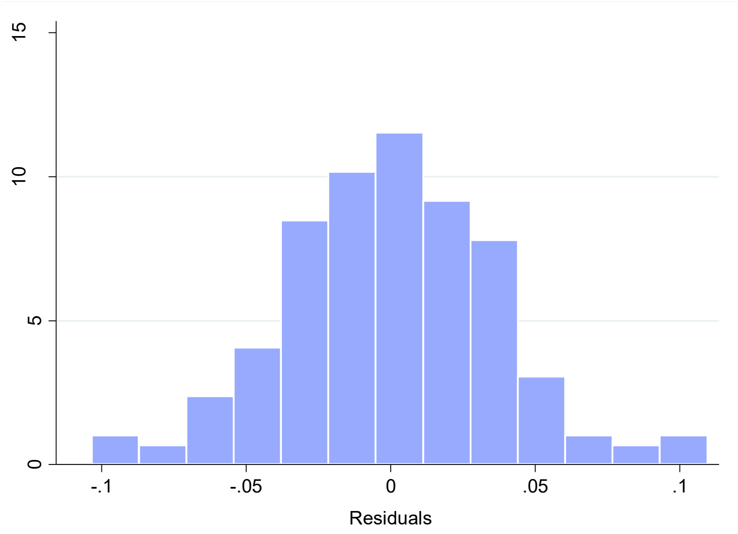

Figure 3. The distribution of residuals after 2FE-estimation with $expenditure$ as the dependent variable.

Source: Own elaboration.

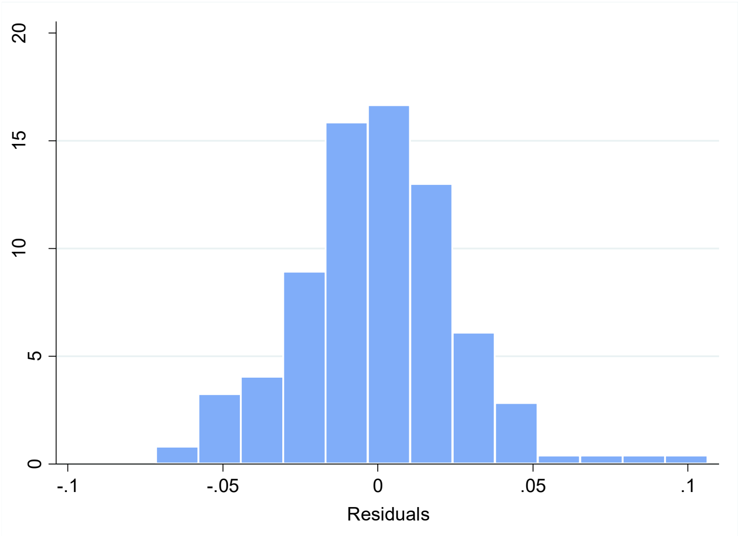

Figure 4. The distribution of residuals after 2FE-estimation with $medicalcare$ as the dependent variable.

Source: Own elaboration.

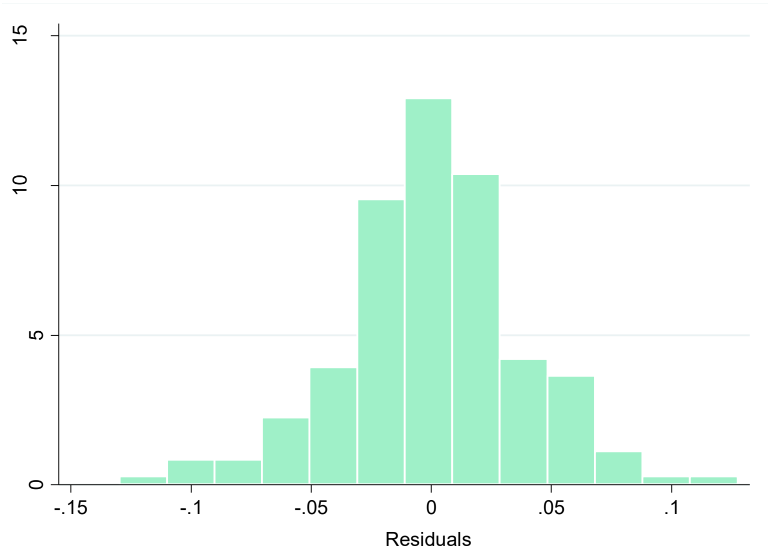

Figure 5. The distribution of residuals after 2FE-estimation with $dentalcare$ as the dependent variable.

Source: Own elaboration.

Wooldridge autocorrelation test

A Wooldridge autocorrelation test measures autocorrelation within the residuals. The null hypothesis of the test is that there is no first-order autocorrelation within the estimated residuals. A significant test result rejects the null hypothesis, thus suggesting that errors are serially correlated. With time-series data, this is expected to happen. The test is computed through a user-written program by Drukker (2003).

Table 22. Wooldridge test for autocorrelation with *expenditure* as the dependent variable.

H0: no first-order autocorrelation **Dependent variable: *expenditure***
F(1, 17) = 24.466 Prob > F = 0.0001

Table 23. Wooldridge test for autocorrelation with *medicalcare* as the dependent variable.

H0: no first-order autocorrelation **Dependent variable: *medicalcare***
F(1, 17) = 21.463 Prob > F = 0.0002

Table 24. Wooldridge test for autocorrelation with *dentalcare* as the dependent variable.

H0: no first-order autocorrelation **Dependent variable: *dentalcare***
F(1, 17) = 15.322 Prob > F = 0.0011

Appendix II

Finally, in this section the regression estimates retrieved by Instrumental Variable-estimation are presented.

The results are presented in tables 25-27, separately for each different dependent variable. As previously discussed, the different model specification- and diagnostic tests performed in chapter 7 suggest that IV-estimation is a sub-optimal method for attaining accurate estimates in this study, with these data. Thus, the results are merely presented in the tables below and not analyzed more thoroughly.

Regression tables

Table 25. Log of operating net expenditure, euro per capita. Different model specifications.

	IV (1)	IV FE (2)	IV FE (3)	IV 2FE (4)
immig_share	-0.0429	0.355	-0.0815*	0.226
	(0.0349)	(1.097)	(0.0434)	(0.756)
pop	-0.0715*	-0.851	-0.0856**	-2.158
	(0.0369)	(4.529)	(0.0422)	(3.824)
dependency	0.000206	0.00407	0.00476	-0.00482
	(0.00156)	(0.00443)	(0.00424)	(0.0195)
highered	0.00878	-0.154	0.0336	0.00915
	(0.0123)	(0.327)	(0.0212)	(0.160)
femployment	-0.00516		0.0113	
	(0.00653)		(0.0167)	
GDPpc	0.150	0.361	0.392	0.201
	(0.295)	(0.433)	(0.394)	(0.636)
2011.year			0.0172	-0.0470
			(0.0276)	(0.346)
2012.year			0.0410	-0.0323
			(0.0477)	(0.624)
2013.year			0.0263	-0.0156
			(0.0646)	(0.805)
2014.year			-0.0136	-0.0386
			(0.0828)	(1.005)
2015.year			-0.0856	-0.0982
			(0.0940)	(1.153)
2016.year			-0.111	-0.184
			(0.102)	(1.390)
2017.year			-0.153	-0.294
			(0.126)	(1.682)
2018.year			-0.156	-0.367
			(0.155)	(2.018)
2019.year			-0.153	-0.374
			(0.177)	(2.224)
Constant	6.149**		1.809	29.31
	(2.843)		(5.221)	(28.48)
Regional effects	No	Yes	No	Yes
Time effects	No	No	Yes	Yes
R-squared	0.429	-1.421	0.494	
Observations	180	180	180	180

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 26. Log of reimbursements for private medical care. Different model specifications.

	IV (1)	IV FE (2)	IV FE (3)	IV 2FE (4)
immig_share	0.0728*	-1.024	0.105*	-1.063
	(0.0402)	(2.118)	(0.0600)	(2.045)
pop	1.196***	7.391	1.194***	8.595
	(0.0584)	(8.381)	(0.0587)	(9.824)
dependency	0.00572***	0.00939	-0.000771	-0.0264
	(0.00199)	(0.00988)	(0.00483)	(0.0559)
highered	-0.0319*	0.278	-0.0556**	-0.271
	(0.0193)	(0.638)	(0.0262)	(0.457)
femployment	0.0259***		0.00647	
	(0.00934)		(0.0187)	
GDPpc	-0.0748	0.672	-0.340	-0.282
	(0.481)	(0.964)	(0.621)	(1.764)
2011.year			0.0411	0.521
			(0.0352)	(0.966)
2012.year			0.0695	0.946
			(0.0582)	(1.746)
2013.year			0.141*	1.275
			(0.0732)	(2.256)
2014.year			0.173*	1.585
			(0.0939)	(2.825)
2015.year			0.229**	1.858
			(0.107)	(3.252)
2016.year			0.206*	2.189
			(0.119)	(3.912)
2017.year			0.219	2.613
			(0.148)	(4.724)
2018.year			0.221	3.110
			(0.178)	(5.663)
2019.year			0.235	3.422
			(0.201)	(6.241)
Constant	-5.719		-0.541	-68.39
	(5.124)		(7.953)	(69.15)
Regional effects	No	Yes	No	Yes
Time effects	No	No	Yes	Yes
R-squared	0.983	-9.679	0.983	
Observations	180	180	180	180

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 27. Log of reimbursements for private dental care. Different model specifications.

	IV	IV FE	IV FE	IV 2FE
	(1)	(2)	(3)	(4)
immig_share	0.175***	-0.989	0.173**	-1.049
	(0.0584)	(1.969)	(0.0701)	(1.939)
pop	1.192***	7.380	1.185***	8.265
	(0.0812)	(7.861)	(0.0821)	(9.324)
dependency	0.00427	0.0108	0.00345	-0.0188
	(0.00355)	(0.00758)	(0.00618)	(0.0521)
highered	-0.0571**	0.219	-0.0568	-0.235
	(0.0263)	(0.585)	(0.0348)	(0.443)
femployment	0.0291		0.0280	
	(0.0209)		(0.0263)	
GDPpc	-0.685	0.626	-0.698	-0.205
	(0.584)	(0.925)	(0.676)	(1.719)
2011.year			0.0303	0.471
			(0.0386)	(0.919)
2012.year			0.0358	0.845
			(0.0642)	(1.660)
2013.year			0.0570	1.100
			(0.0874)	(2.149)
2014.year			0.0596	1.352
			(0.114)	(2.695)
2015.year			0.0793	1.566
			(0.133)	(3.102)
2016.year			0.0253	1.850
			(0.145)	(3.731)
2017.year			0.0350	2.235
			(0.166)	(4.501)
2018.year			0.0192	2.676
			(0.195)	(5.392)
2019.year			0.0340	2.960
			(0.218)	(5.942)
Constant	0.654		1.025	-68.85
	(6.039)		(8.092)	(65.06)
Regional effects	No	Yes	No	Yes
Time effects	No	No	Yes	Yes
R-squared	0.968	-5.863	0.969	
Observations	180	180	180	180

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1